

(NASA-CR-117725) DATA REPORT FOR APOLLO  
MODEL FS-1 LIFT-TO-DRAG RATIO IMPROVEMENT  
TEST /JPL 20-127/ (North American Aviation,  
Inc.) 66 P

N79-76114

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MODEL FS-1 LIFT-TO-DRAG RATIO  
IMPROVEMENT TEST (JPL 20-127)

NAS9-150  
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1 November 1962

APOLLO

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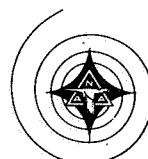
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**DATA REPORT FOR APOLLO  
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1 November 1962

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Prepared by

Apollo Engineering  
Aerodynamics Section

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## FOREWORD

The FS-1 lift-to-drag ratio improvement tests were conducted under NASA Apollo contract NAS9-150.

This report was prepared by J. C. Snowden of the Wind Tunnel Test Group, Space and Information Systems Division of North American Aviation, Inc.



## ABSTRACT

An investigation of aerodynamic devices for improvement of the command module lift-to-drag ratio was conducted in the Jet Propulsion Laboratory's 21-inch hypersonic wind tunnel at Mach number 7.3 using a 0.02-scale Apollo force model (FS-1). Descriptions of the model, model photographs, and tunnel installations are presented in this report with actual tunnel operating conditions. The six-component force and moment data are presented in both plotted and tabulated form.

Basic wind tunnel test data are presented only to make the test results available at the earliest possible date; analyses and summary of results will be reported later.



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## I. INTRODUCTION

Apollo force model FS-1 was tested in the Jet Propulsion Laboratory's 21-inch supersonic wind tunnel 27 and 28 September 1962.

This test was conducted to determine if specific modifications to the command module heat shield would trim the command module at 147 degrees angle of attack with the present center of gravity while increasing the lift-to-drag ratio (L/D) at hypersonic Mach numbers. To accomplish this, the static stability of eight configurations was investigated at Mach 7.3.

A total number of 241 acceptable data points were taken at the one Mach number and a Reynolds number of  $0.84 \times 10^6$  based on the command module diameter.

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## II. MODEL DESCRIPTION

The model tested was a 0.02-scale model with eight different heat shield shapes. The command module has a balance cavity angle of 20 degrees with the axis of symmetry. The balance cavity angle of 20 degrees was used to obtain an angle-of-attack range of 123 to 179 degrees. Each heat shield incorporated a different lift-to-drag ratio improvement device, such as a fixed flap on the lower edge of the heat shield, a canted heat shield, or an offset heat shield. The configurations tested are shown in Figure 1 with a typical reference center of gravity.

The models were designed and fabricated by North American Aviation, Inc. Parts and pertinent detail drawings for the command module are presented in the following listing:

Symbol	NAA Drawing Number	Part Number
C <sub>2</sub>	7121-1062	-2
C <sub>25</sub>	7121-1069	-6, 2
C <sub>26</sub>	7121-1069	-7, -8
C <sub>27</sub>	7121-0169	-12, -8
C <sub>28</sub>	7121-0169	-13, -8
C <sub>29</sub>	7121-0169	-8, -10
C <sub>30</sub>	7121-0169	-8, -10
C <sub>31</sub>	7121-0169	-8, -10
C <sub>32</sub>	7121-0169	-14, -8

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### III. INSTRUMENTATION AND OPERATING CONDITIONS

#### FORCE MEASUREMENT

Six-component force and moment data were measured with the water-cooled JPL SGB6-5 balance. The balance was mounted on a 9-degree bent sting with the Douglas offset remote roll head (Figure 2). Essentially two angle-of-attack ranges were obtained with this arrangement. With the remote roll at 0 degrees, the range was from 151 to 179 degrees; and with the roll equal to 180 degrees, the range was 123 to 151 degrees.

#### FLOW VISUALIZATION

Photographs were taken for each setup (Figures 4 through 12) and Schlieren photographs (Figures 13 through 20) were taken at approximately 15-degree intervals for each configuration and Mach number.

#### FLOW CONDITIONS

Tests were conducted at the nominal flow conditions:  $M = 7.33$ , Reynolds number (based on command module diameter) =  $0.84 \times 10^6$ , and dynamic pressure =  $440 \text{ lb}/\text{ft}^2$ .

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## IV. TEST PROGRAM

The actual test program conducted at Mach number 7.33 and  $\theta = 160$  is presented in the following listing. The angle-of-attack range was specified so that lift-to-drag ratio and  $C_{m_{cg}}$  could be obtained at or near the trim point.

Configuration	$\phi_B$	Run Number	$\alpha$ Range
C <sub>2</sub>	0	11	151 to 179
C <sub>2</sub>	180	12	123 to 151
C <sub>26</sub>	0	13	151 to 179
C <sub>26</sub>	180	14	123 to 151
C <sub>25</sub>	0	15	151 to 179
C <sub>25</sub>	180	16	123 to 151
C <sub>25</sub>	0	17	151 to 179
C <sub>25</sub>	180	18	123 to 151
C <sub>27</sub>	0	19	151 to 179
C <sub>27</sub>	180	20	123 to 151
C <sub>28</sub>	0	21	151 to 179
C <sub>28</sub>	0	22	151 to 179
C <sub>28</sub>	180	23	123 to 151
C <sub>29</sub>	0	24	151 to 179
C <sub>29</sub>	180	25	123 to 151
C <sub>30</sub>	0	32	151 to 179
C <sub>30</sub>	180	33	123 to 151
C <sub>31</sub>	0	34	151 to 179
C <sub>31</sub>	180	35	123 to 151
C <sub>26</sub>	0	38	151 to 179
C <sub>26</sub>	180	39	123 to 151
C <sub>27</sub>	0	42	151 to 179
C <sub>27</sub>	180	43	123 to 151
C <sub>32</sub>	0	46	151 to 179
C <sub>32</sub>	180	47	123 to 151
C <sub>2</sub>	0	48	151 to 179
C <sub>2</sub>	180	49	123 to 151

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## DATA REDUCTION CONSTANTS

Constants used in the data reduction are as follows:

Reference area =  $S = 7.4506 \text{ in.}^2$

Reference length =  $d = 3.080 \text{ in.}$

Reference center-of-gravity location

$\bar{x} = 2.1118$  inches aft of command module apex along the axis of symmetry

$\bar{z} = 0.1817$  inches below axis of symmetry

## NOMENCLATURE

The tabulated data format is given at the top of each data page. The following nomenclature was used.

$\alpha$  Angle of attack, degrees

$\phi_B$  Sting roll angle, degrees

$C_N$  Normal force coefficients

$C_A$  Axial force coefficient

$C_{mA}$  Pitching moment coefficient about the apex

$\frac{x_{cp}}{d}$  Center of pressure measured from the apex along the axis of symmetry

$C_Y$  Side force coefficient

$C_n$  Yawing moment coefficient

$C_L$  Lift coefficient

$C_D$  Drag coefficient

$C_{m_{cg}}$  Pitching moment coefficient about the center of gravity,

$M$  Mach number

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## DATA ACCURACY

The balance was calibrated prior to the test. Normal and axial force accuracies stated by JPL were 0.2 percent of maximum balance rating and the total pressure was measured with an accuracy of 0.2 percent of the measured value. Using these given accuracies and an estimated machining accuracy on the radius of the command module of 0.001 inches, a maximum possible error was calculated for each coefficient. These maximum possible errors were calculated using a total differential method and are tabulated as follows:

$d\alpha$	$dC_N$	$dC_A$	$dC_{m_{cg}}$	$dC_L$	$dC_D$	$dC_{mA}$
$\pm 0.1$	$\pm 0.0060$	$\pm 0.0050$	$\pm 0.0001$	$\pm 0.0050$	$\pm 0.010$	$\pm 0.0001$

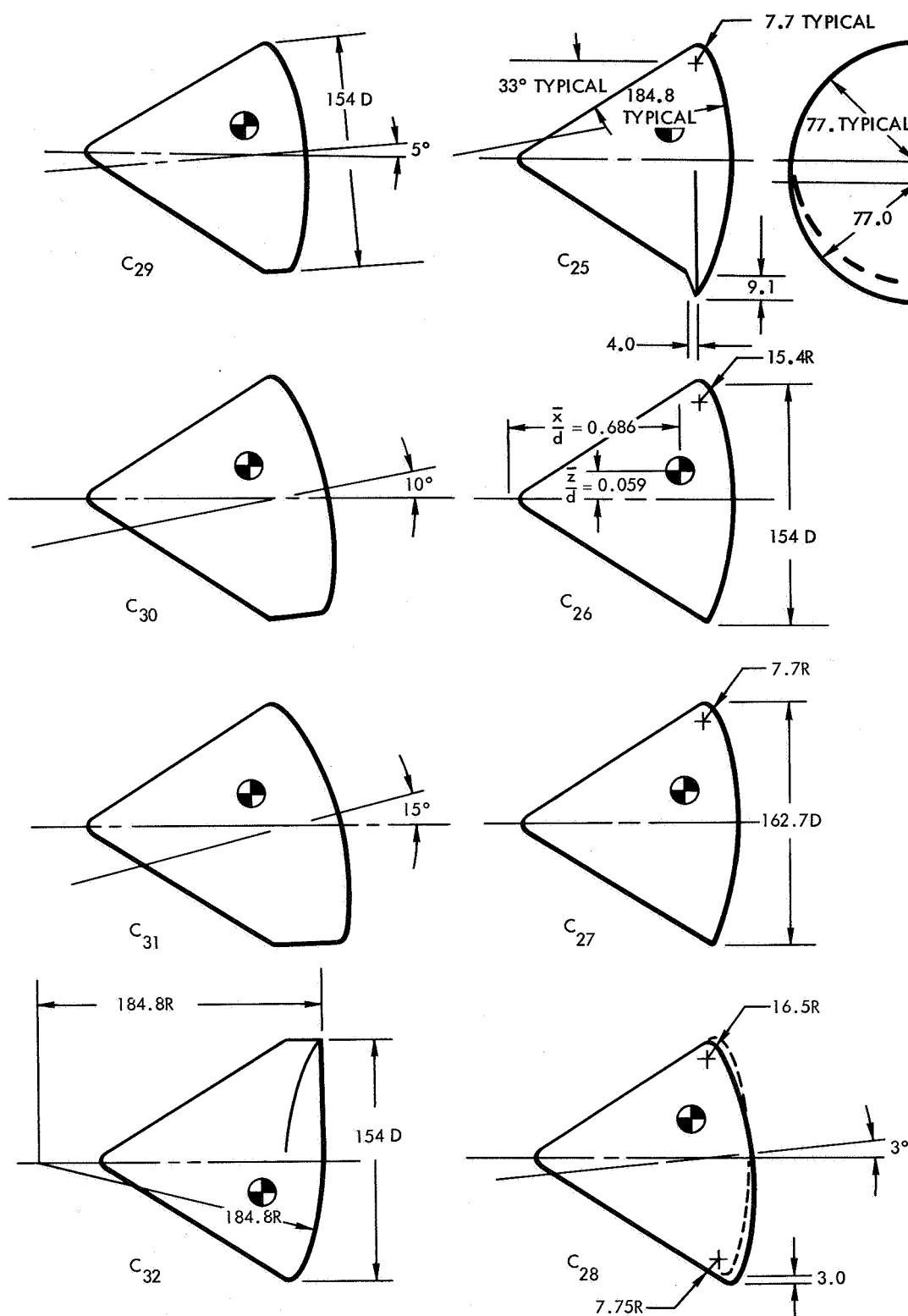
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Figure 1. Model Diagram

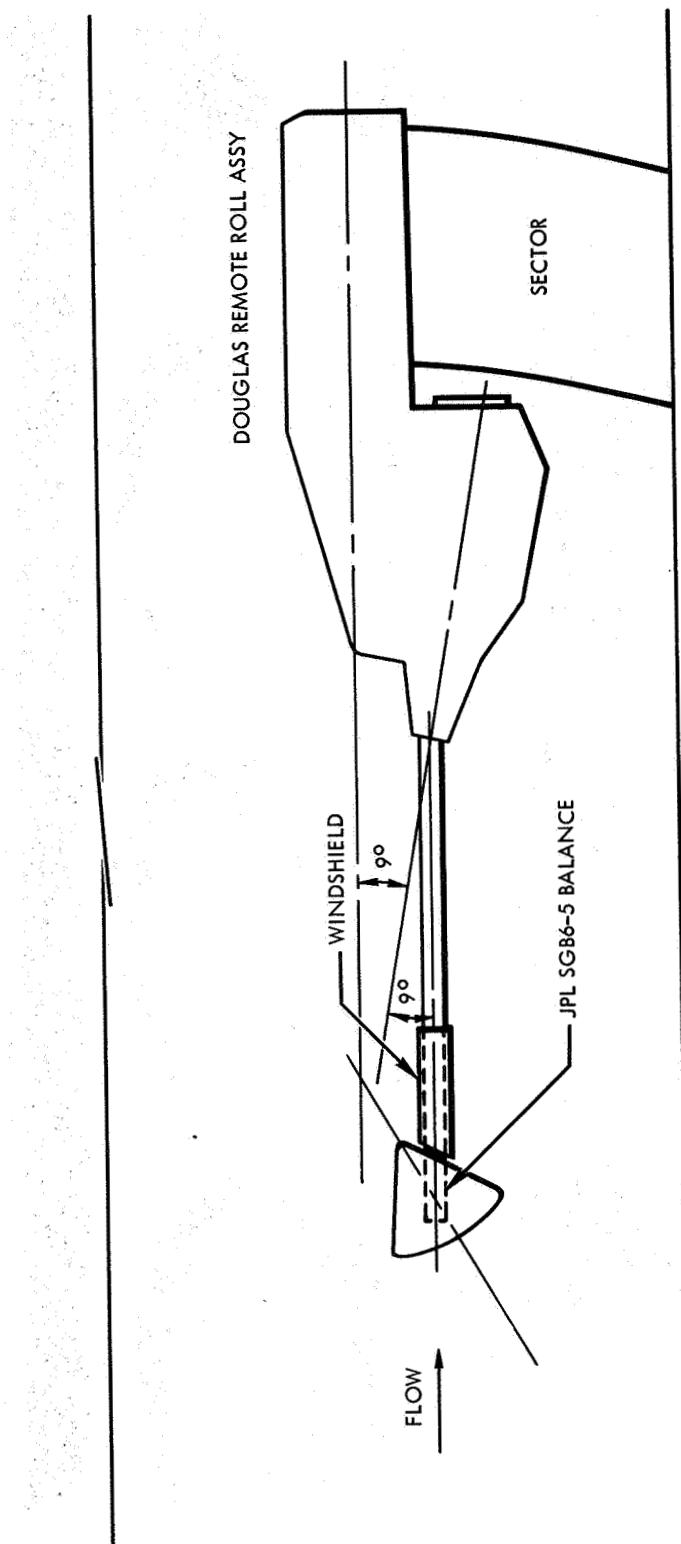
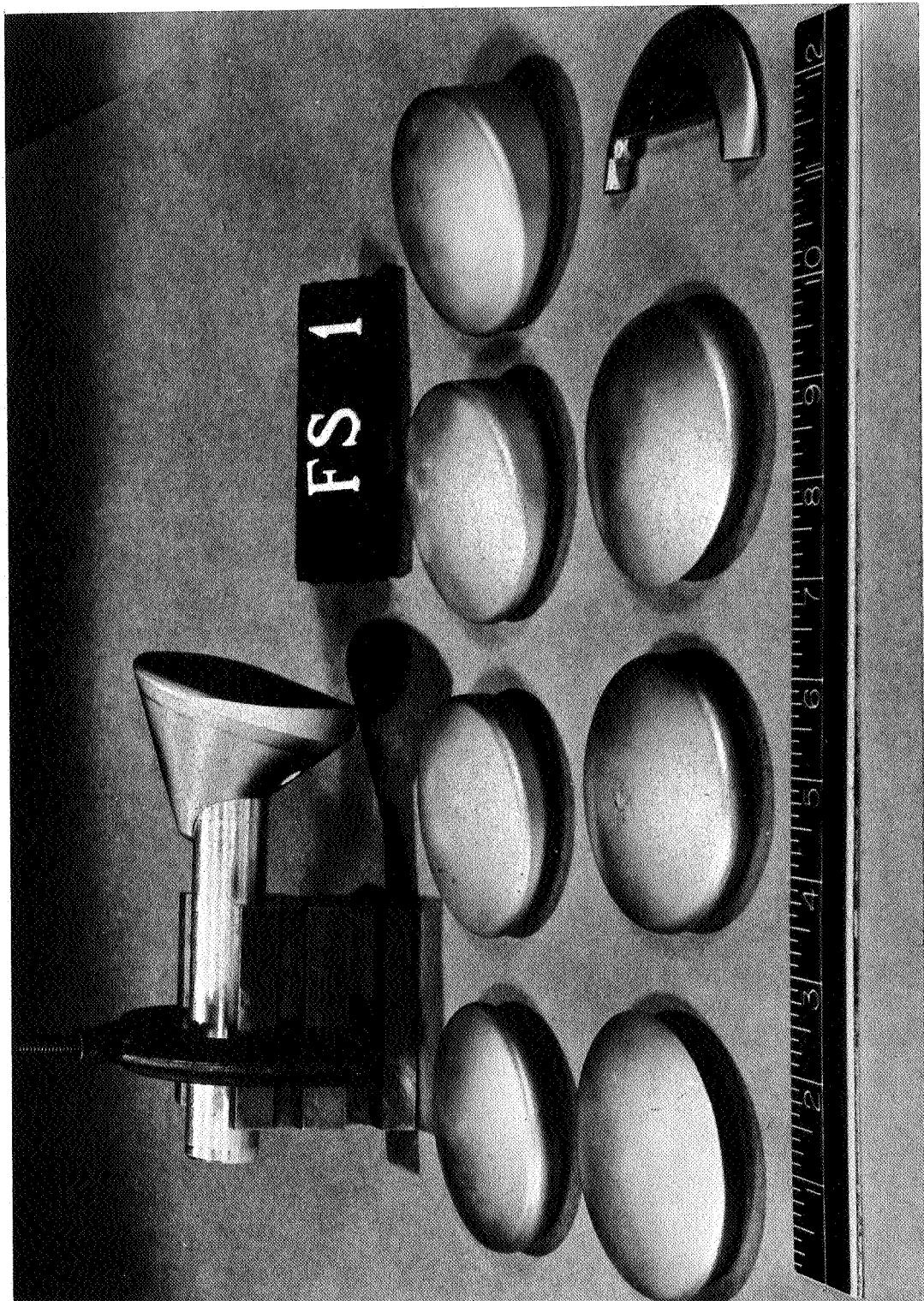


Figure 2. Model Installation

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Figure 3. Model Parts

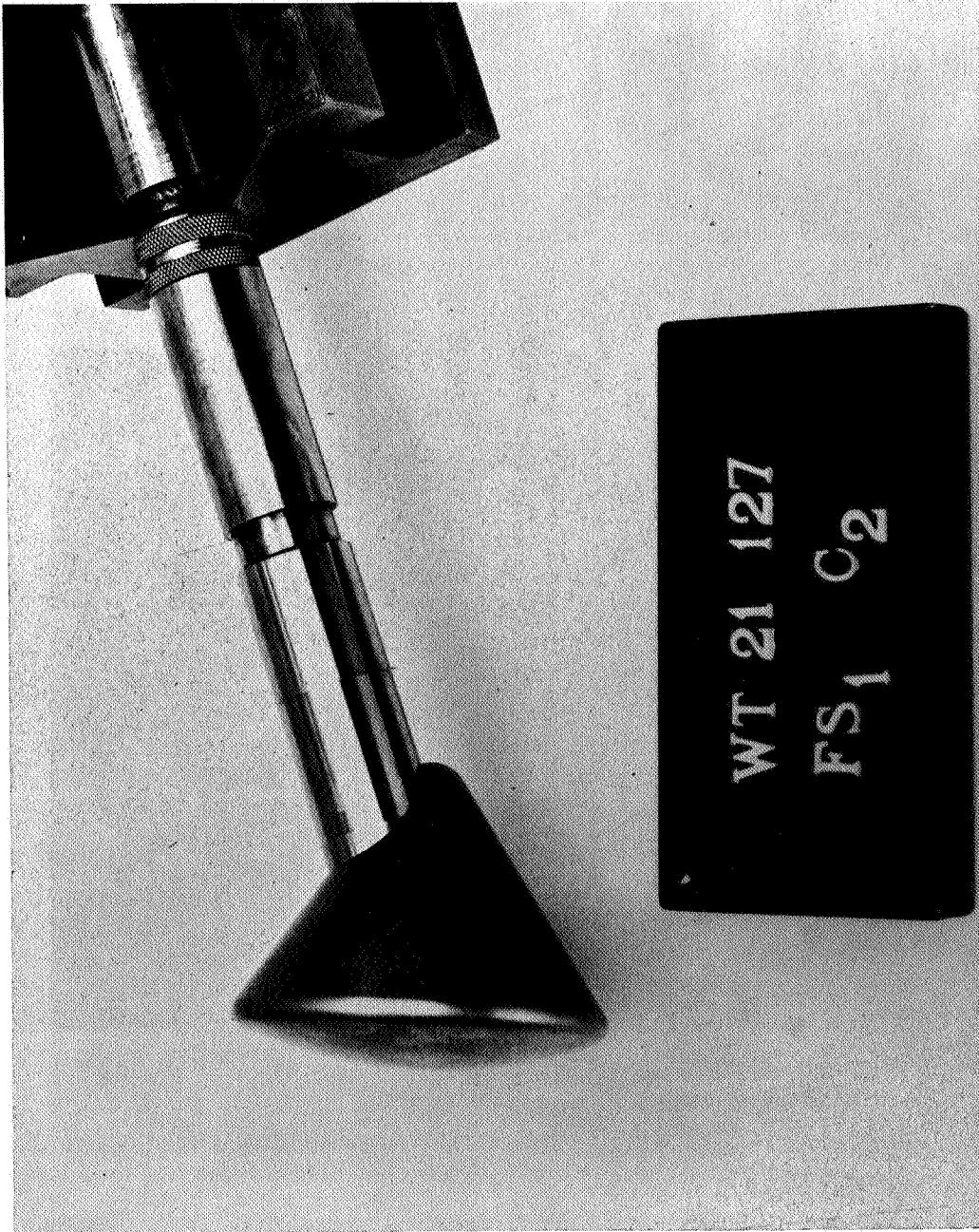
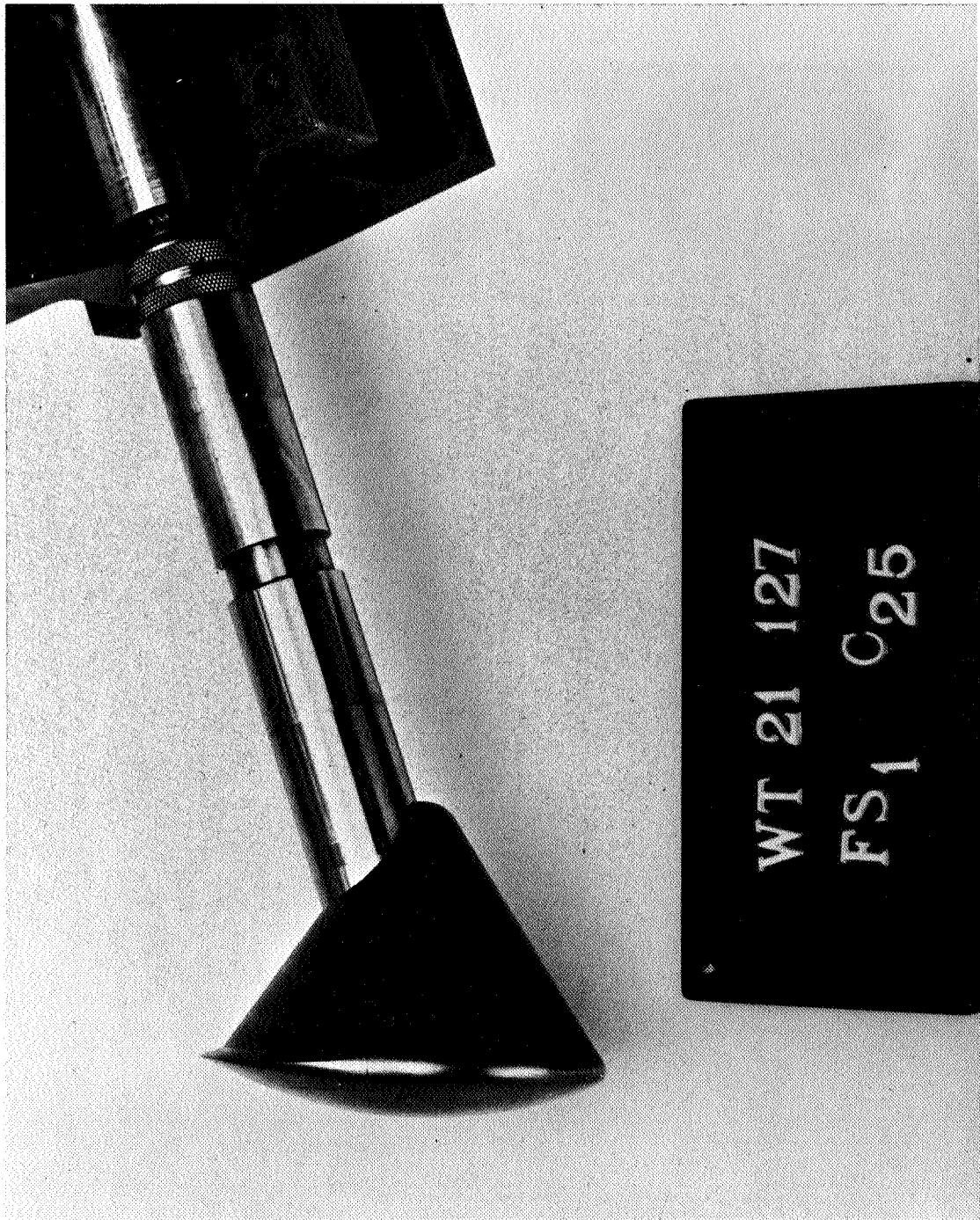


Figure 4. Basic Command Module - C<sub>2</sub>

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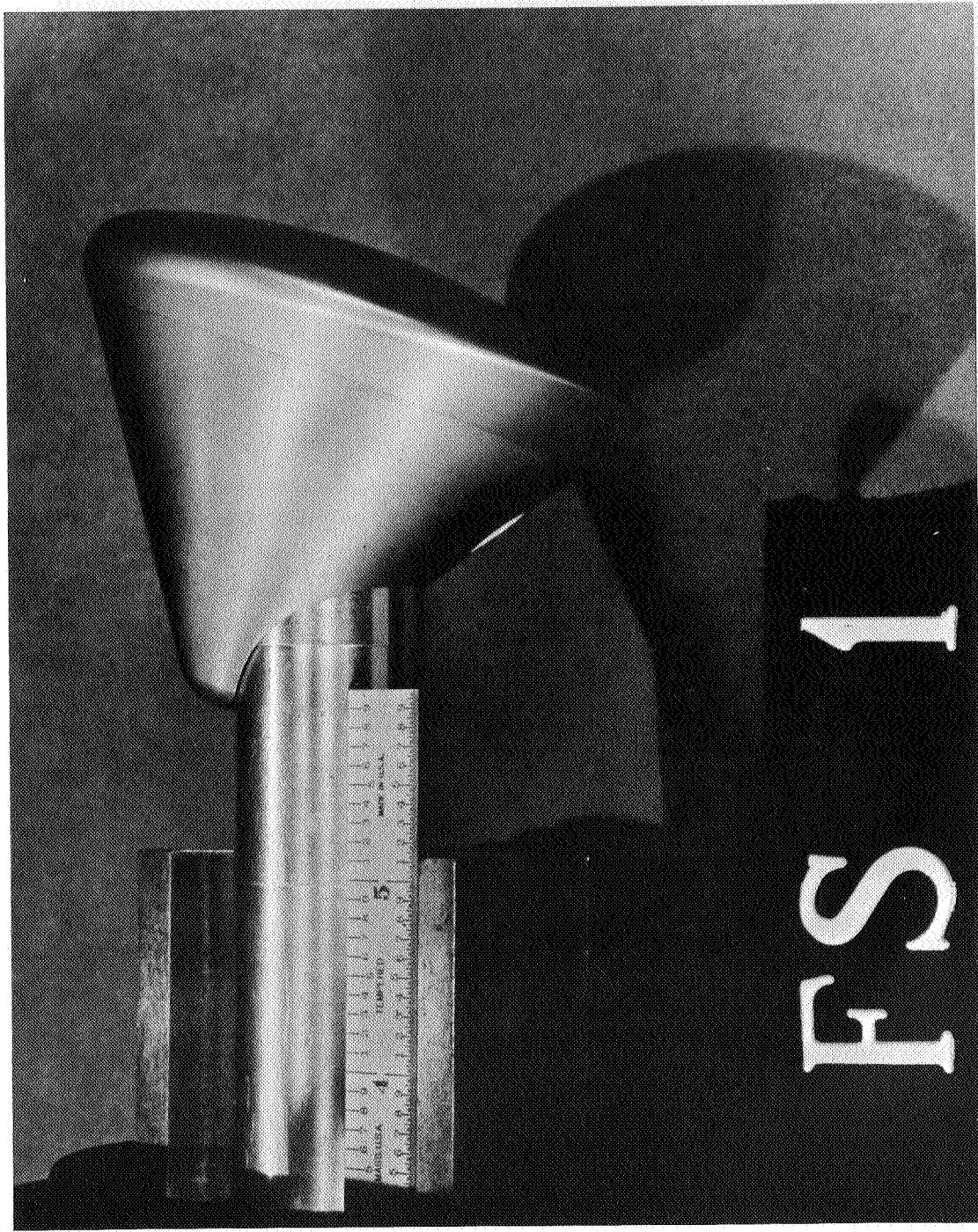
700-98-179

Figure 5. Basic Command Module with Flap - C25

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Figure 6. Command Module with 0- and 15.4-Inch Full-Scale Corner Radii - C<sub>26</sub>~~CONFIDENTIAL~~



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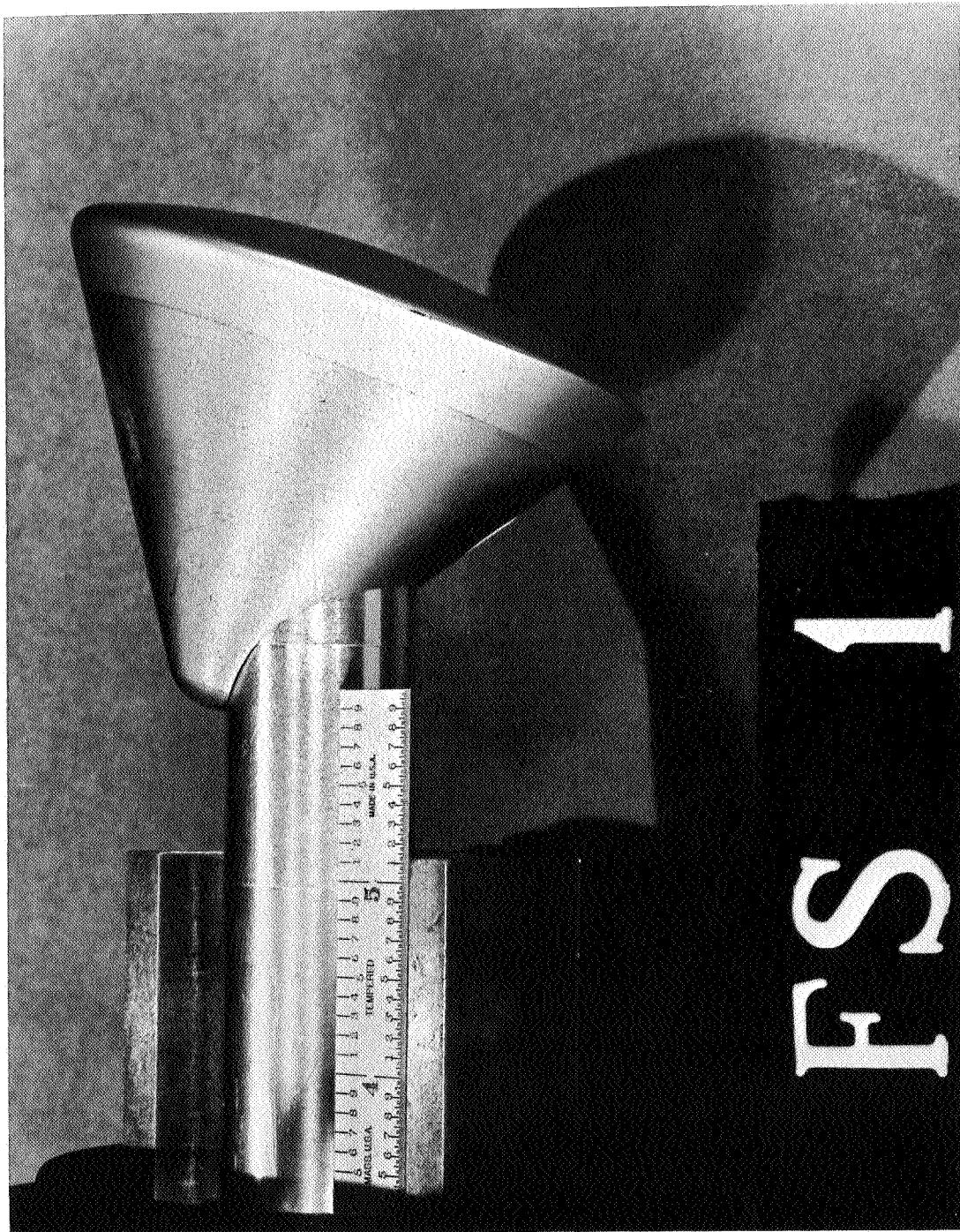


Figure 7. Command Module with 0- and 7.7-Inch Full-Scale Corner Radii - C<sub>27</sub>



700-98-182

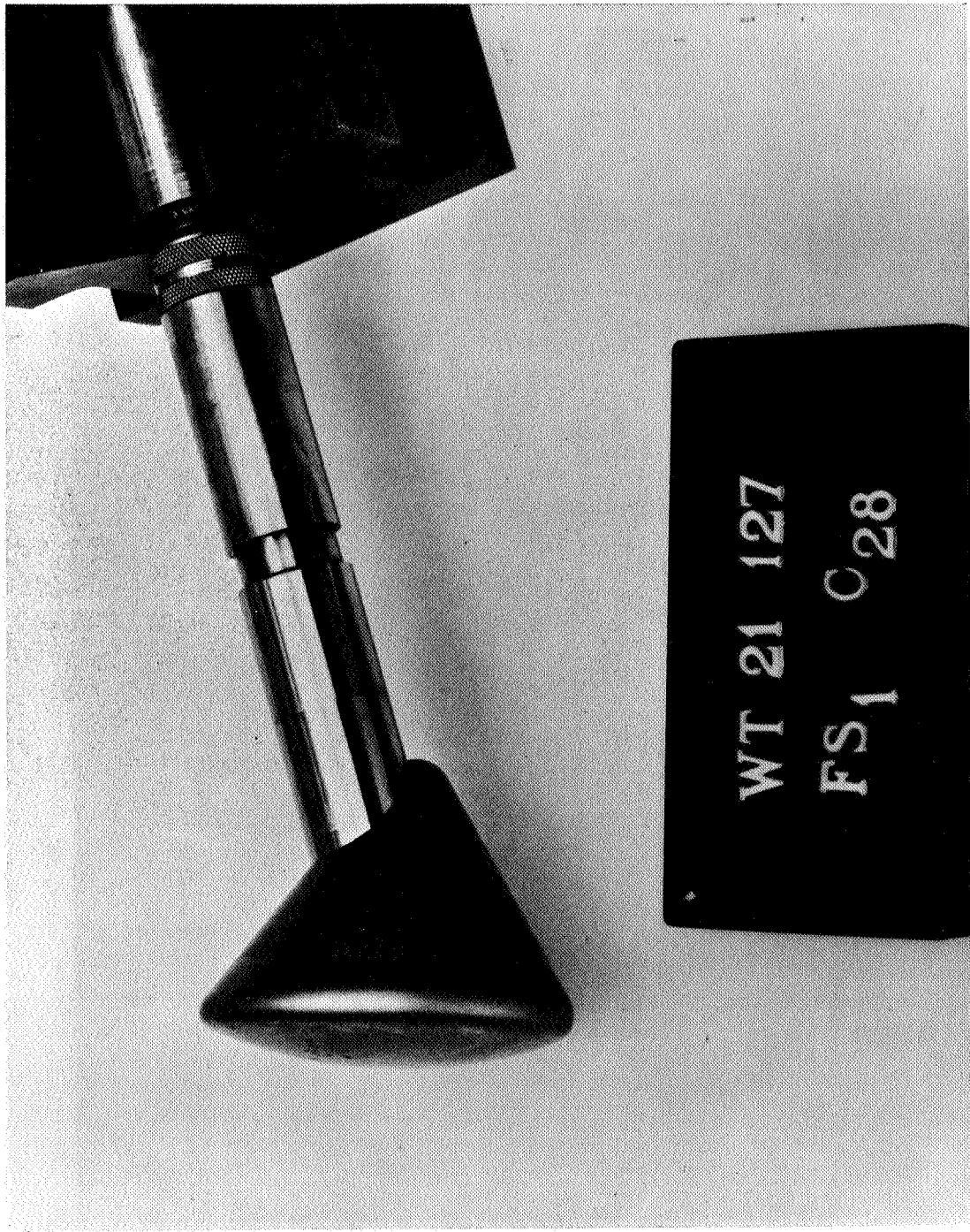
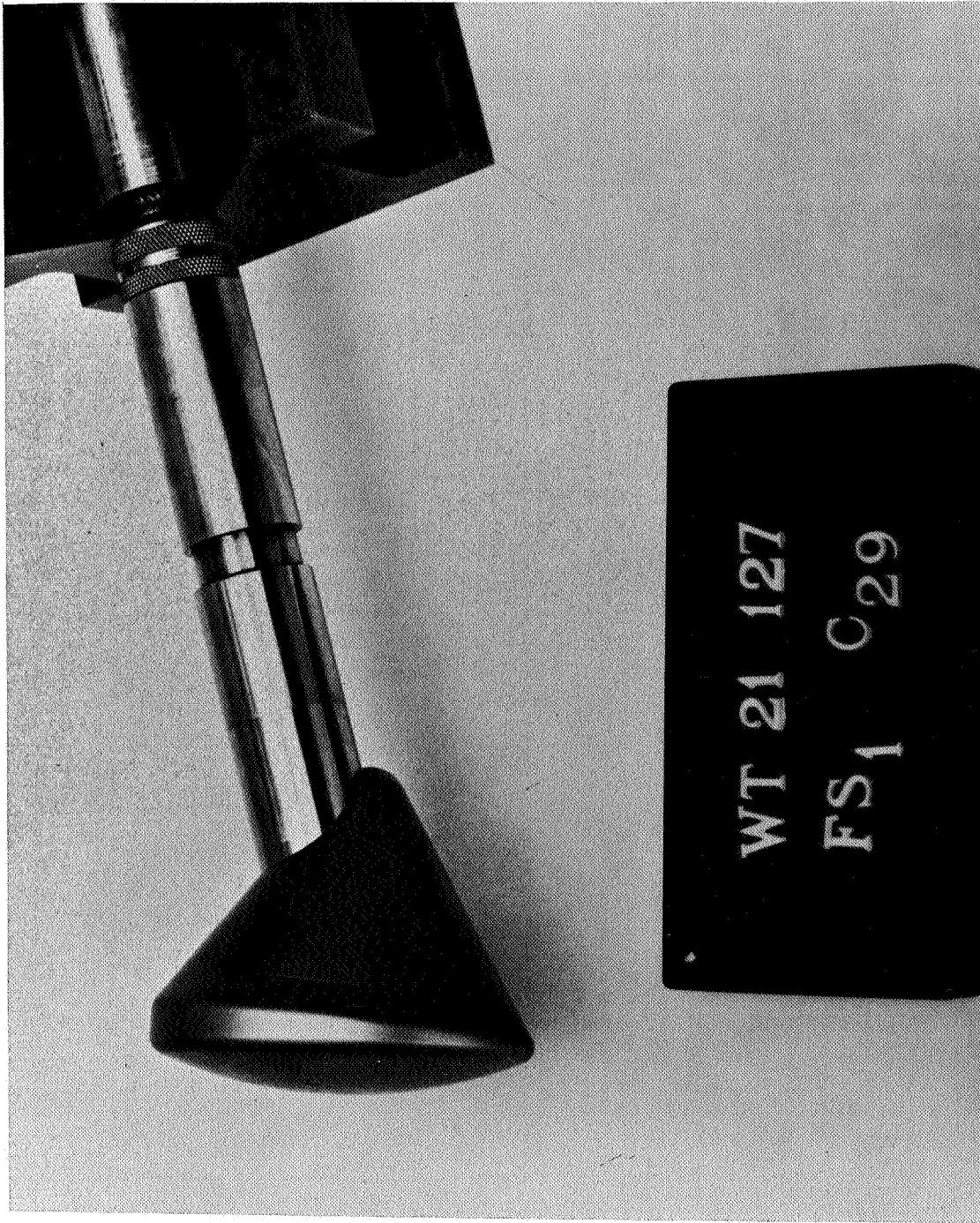
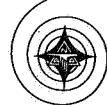


Figure 8. Command Module with 3-Degree Canted Heat Shield and 3-Inch Full-Scale Offset - C28

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Figure 9. Command Module with 5-Degree Canted Heat Shield - C<sub>29</sub>

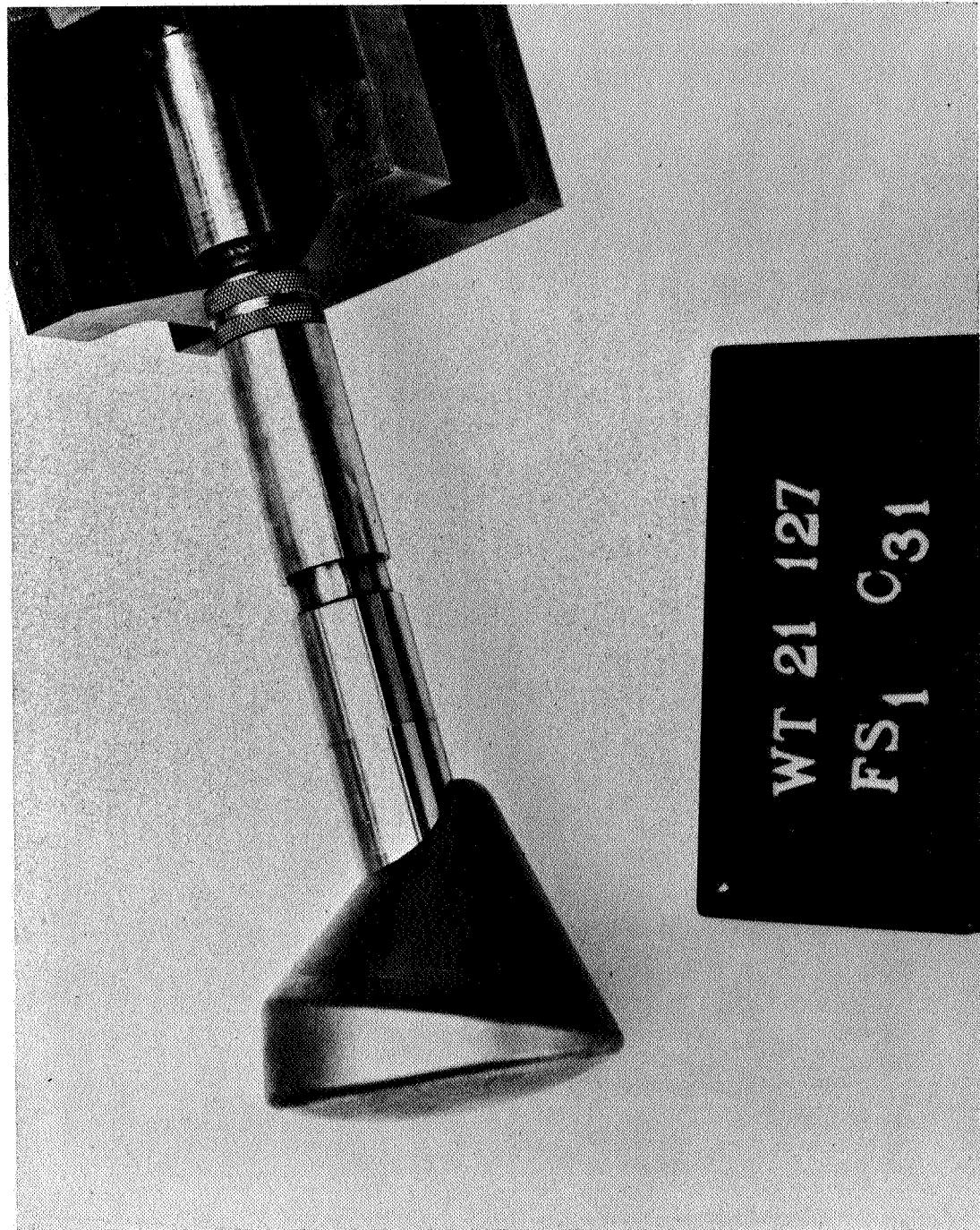


700-98184



Figure 10. Command Module with 10-Degree Canted Heat Shield - C30

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700-98-18c

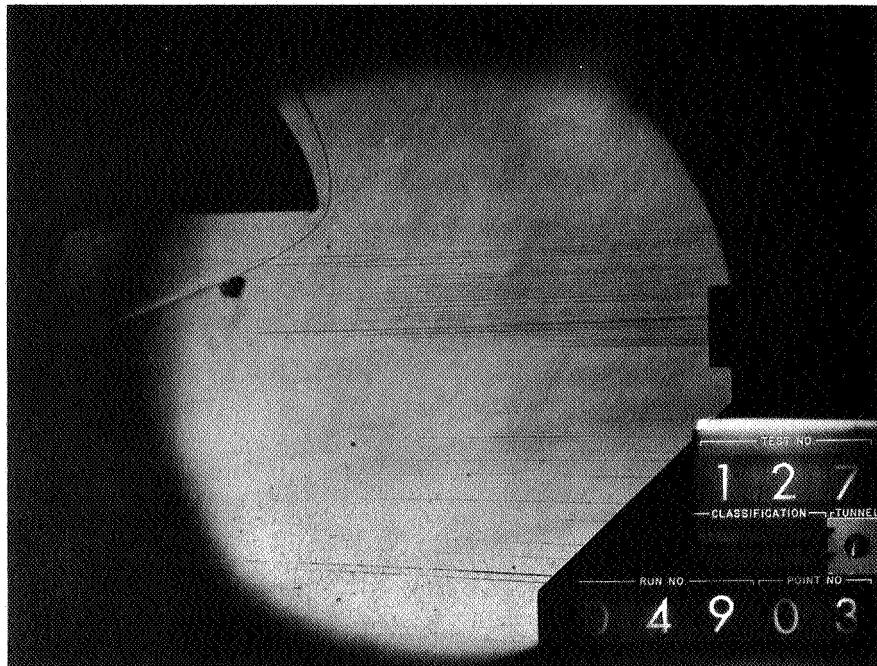
Figure 11. Command Module with 15-Degree Canted Heat Shield - C31

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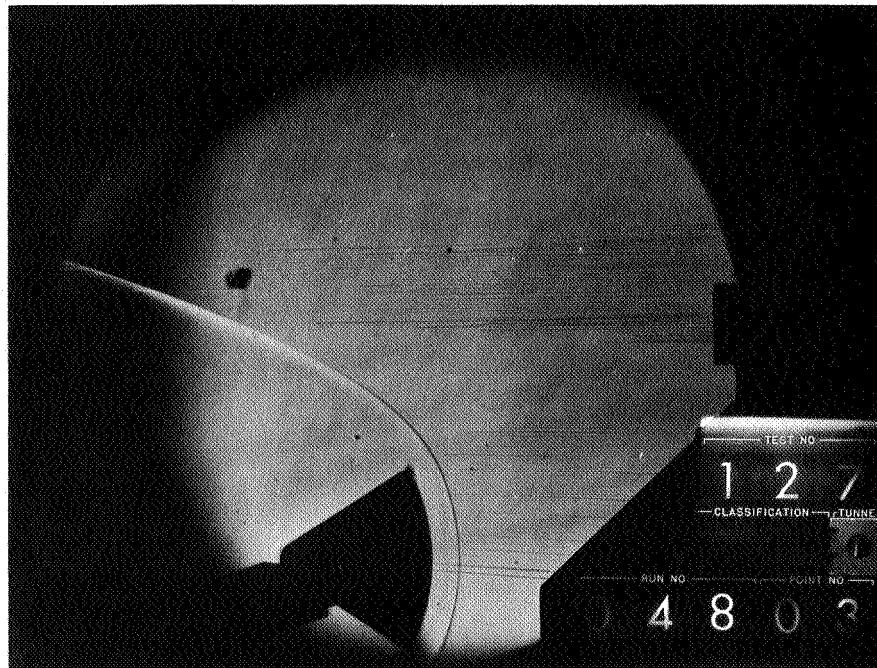


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Figure 12. Command Module with Half-Spherical and Half-Cylindrical Heat Shield - C<sub>32</sub>~~CONFIDENTIAL~~

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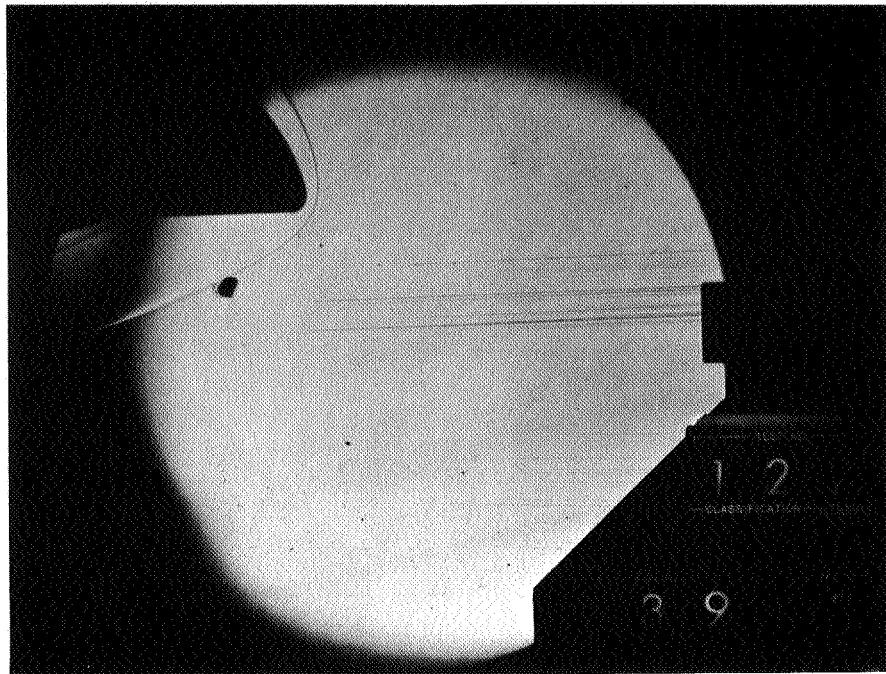
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 $\alpha = 150^\circ$



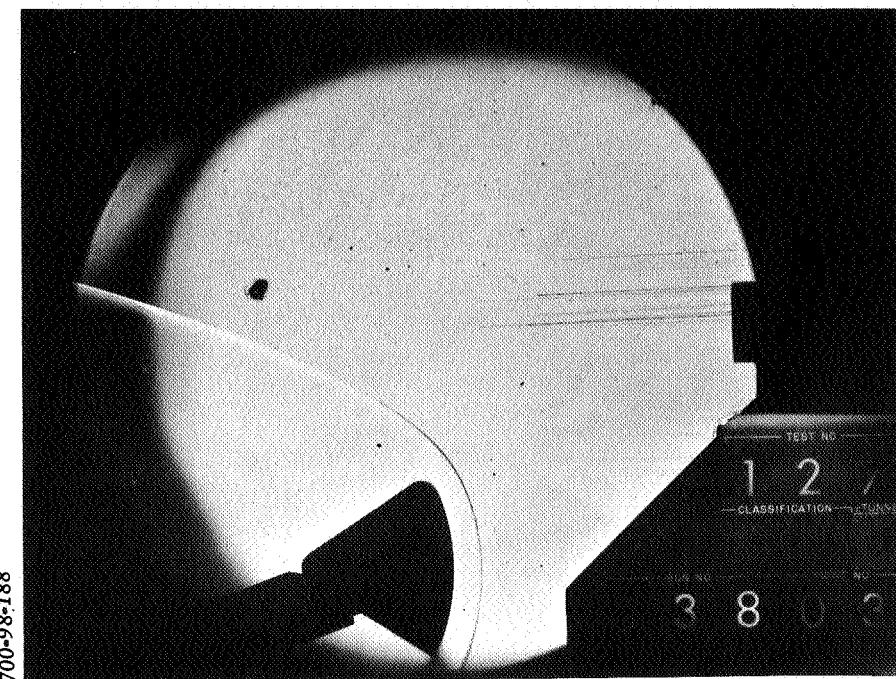
$M = 7.3$   
 $\alpha = 180^\circ$

Figure 13. C<sub>2</sub> Typical Schlieren

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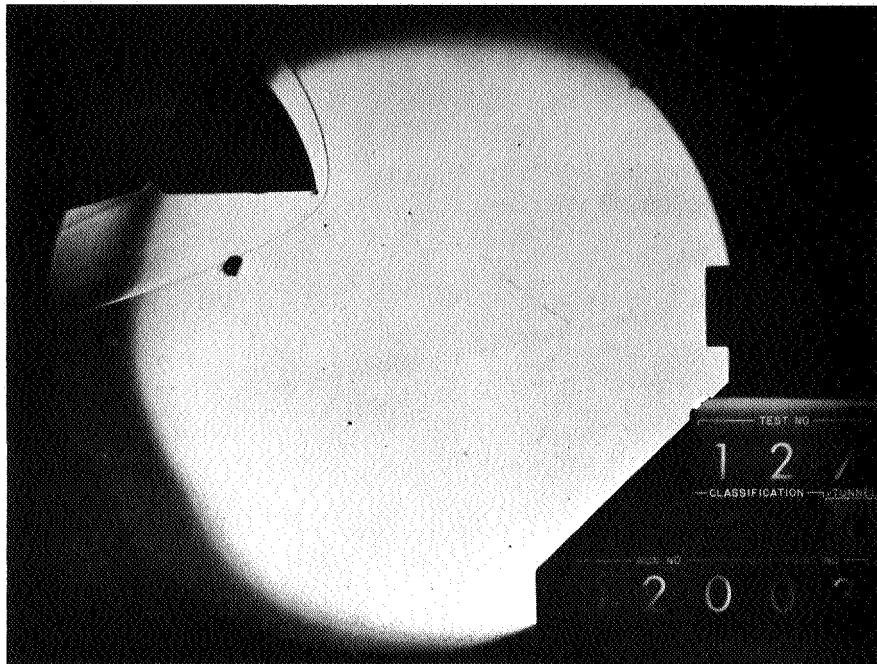
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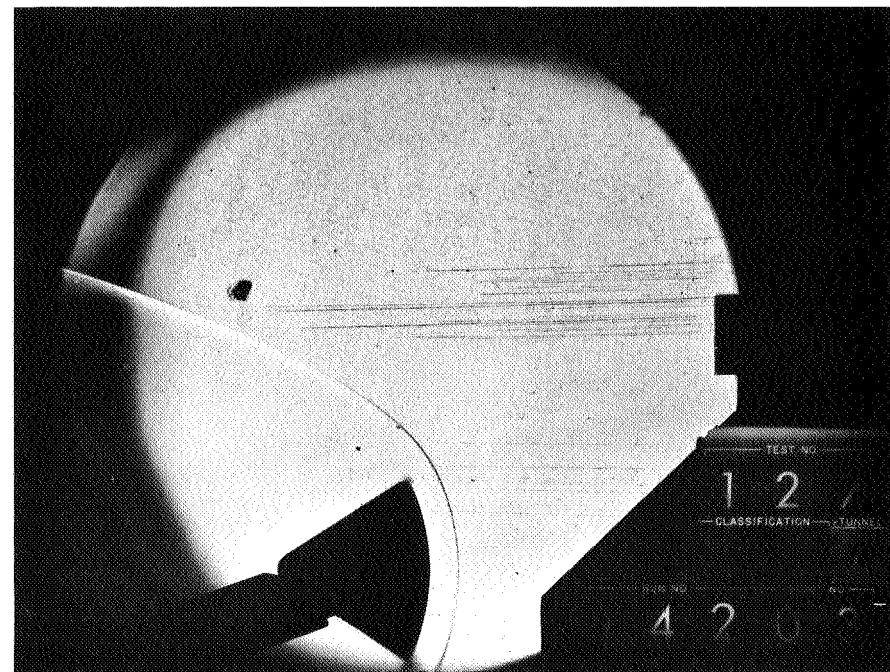
$M = 7.3$   
 $\alpha = 180^\circ$

Figure 14. C<sub>26</sub> Typical Schlieren

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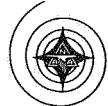
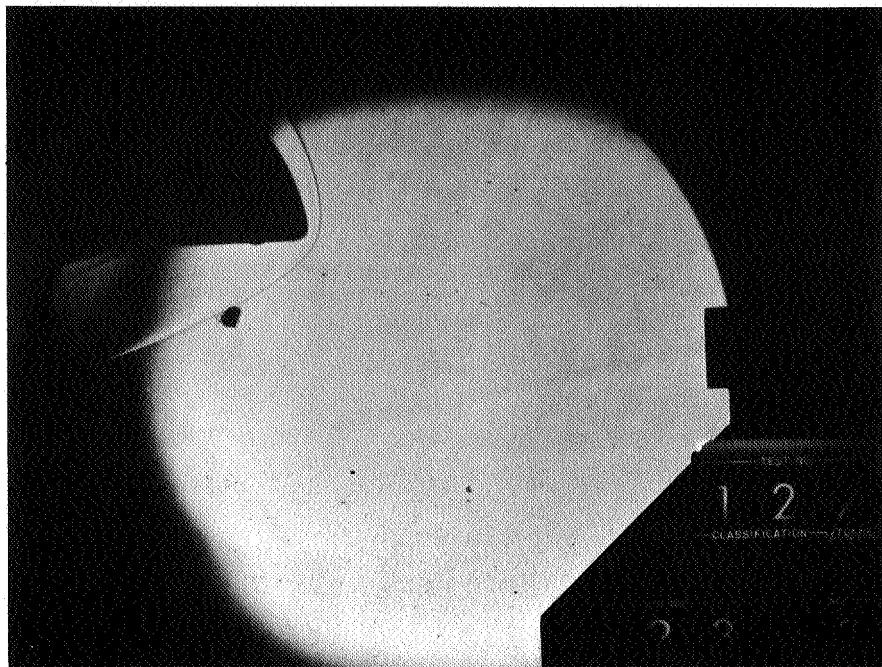
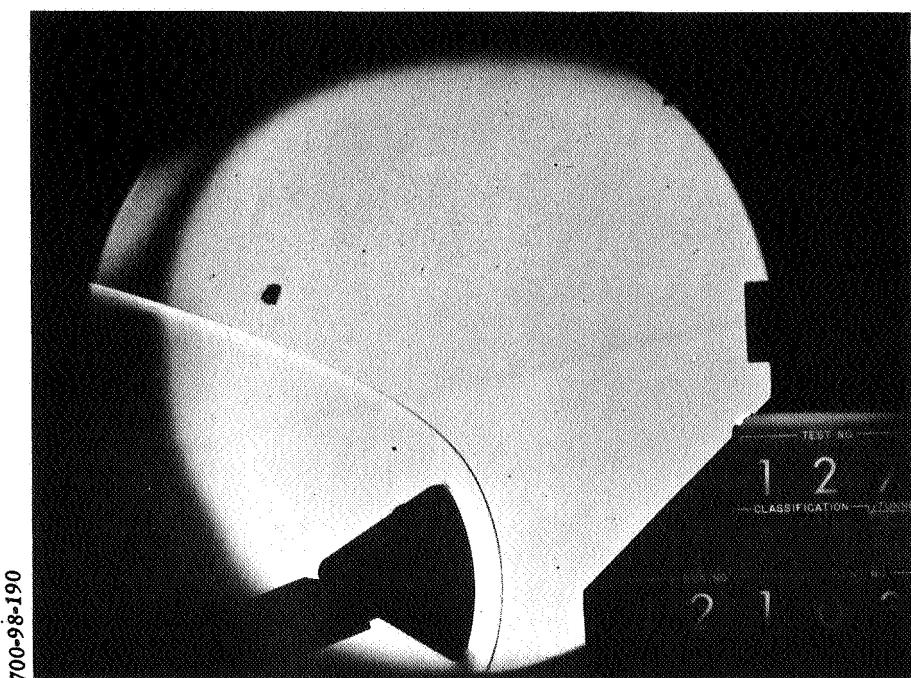
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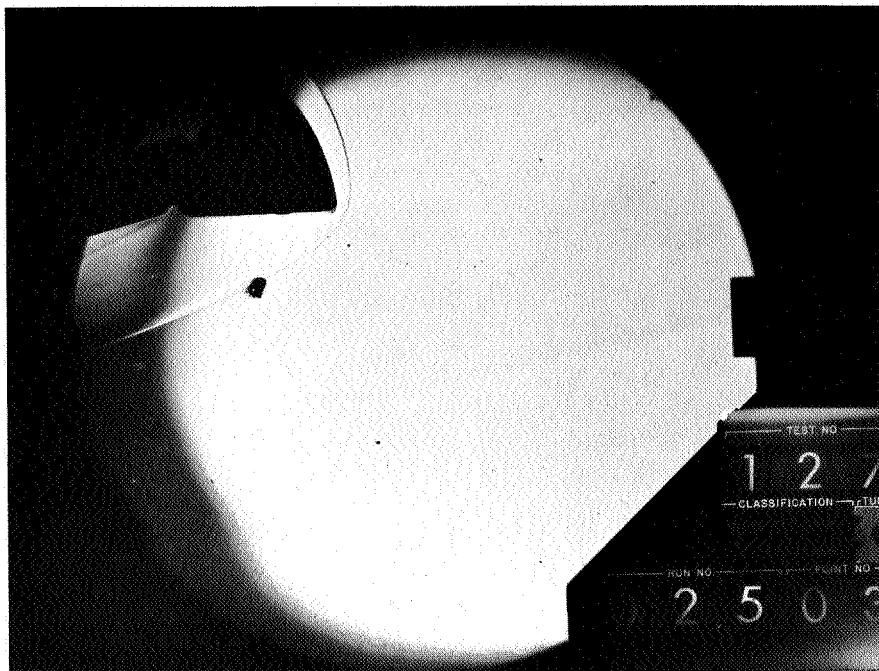
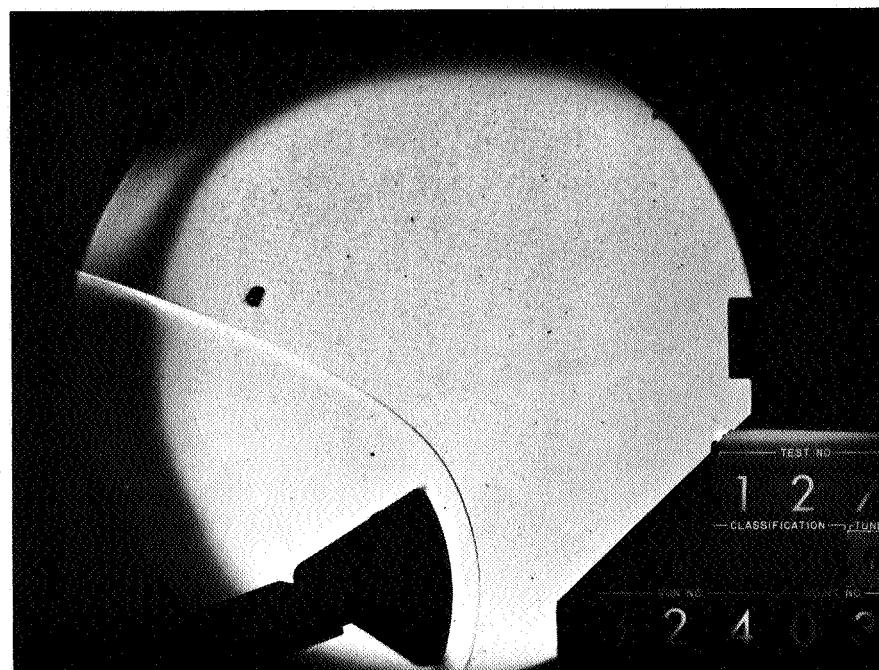
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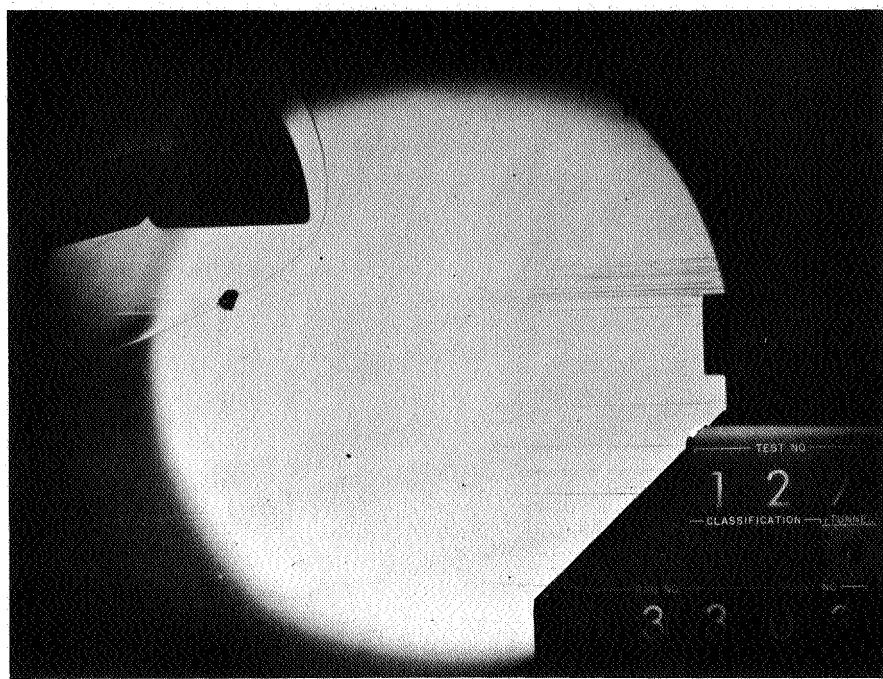
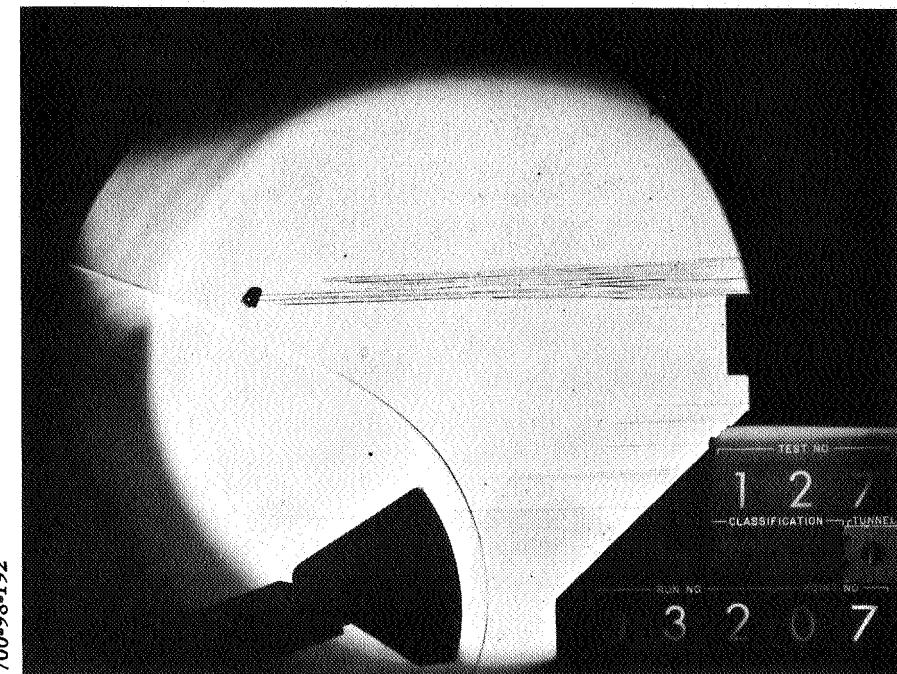


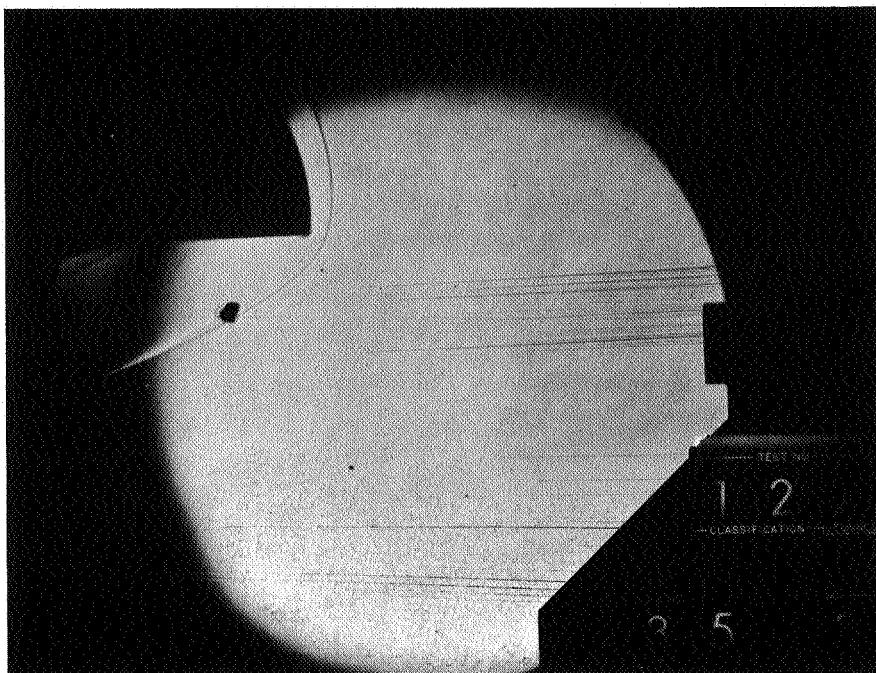
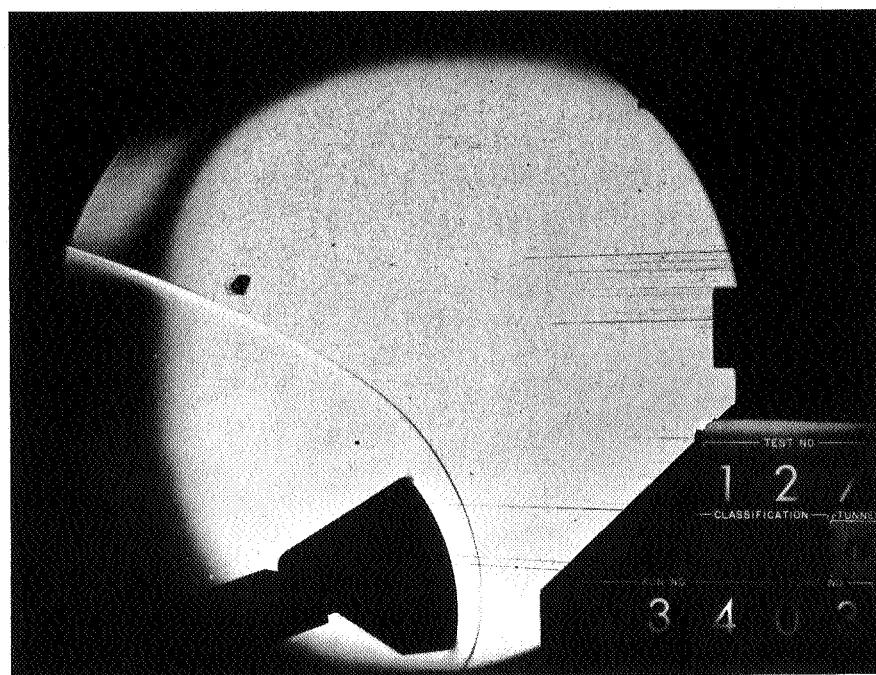
$M = 7.3$   
 $\alpha = 180^\circ$

Figure 15. C<sub>27</sub> Typical Schlieren

~~CONFIDENTIAL~~ $M = 7.3$   
 $\alpha = 150^\circ$  $M = 7.3$   
 $\alpha = 180^\circ$ Figure 16. C<sub>28</sub> Typical Schlieren~~CONFIDENTIAL~~

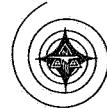
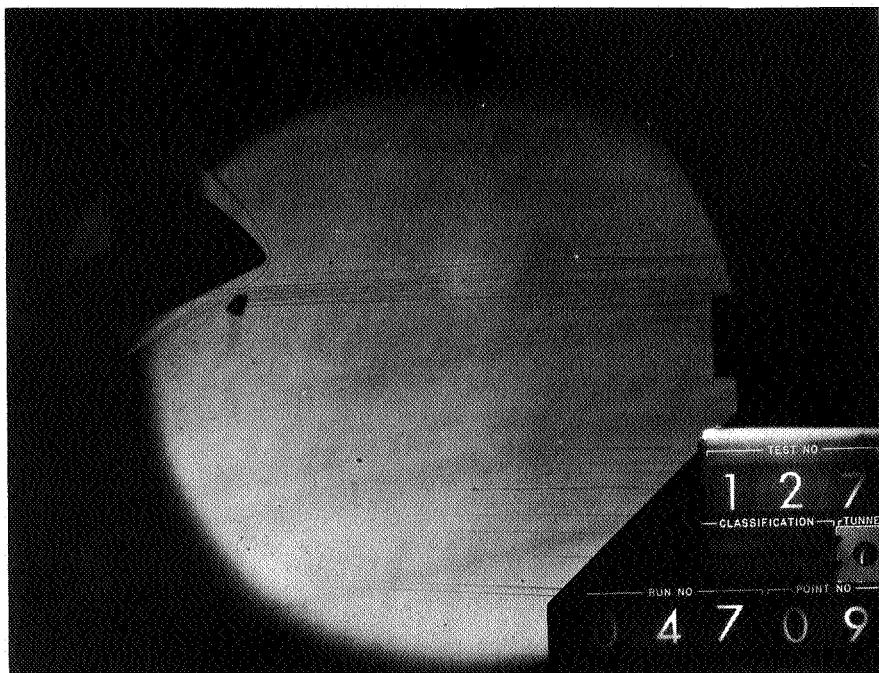
~~CONFIDENTIAL~~ $M = 7.3$   
 $\alpha = 150^\circ$  $M = 7.3$   
 $\alpha = 180^\circ$ Figure 17. C<sub>29</sub> Typical Schlieren~~CONFIDENTIAL~~

**CONFIDENTIAL** $M = 7.3$   
 $\alpha = 150^\circ$  $M = 7.3$   
 $\alpha = 180^\circ$ Figure 18.  $C_{30}$  Typical Schlieren**CONFIDENTIAL**

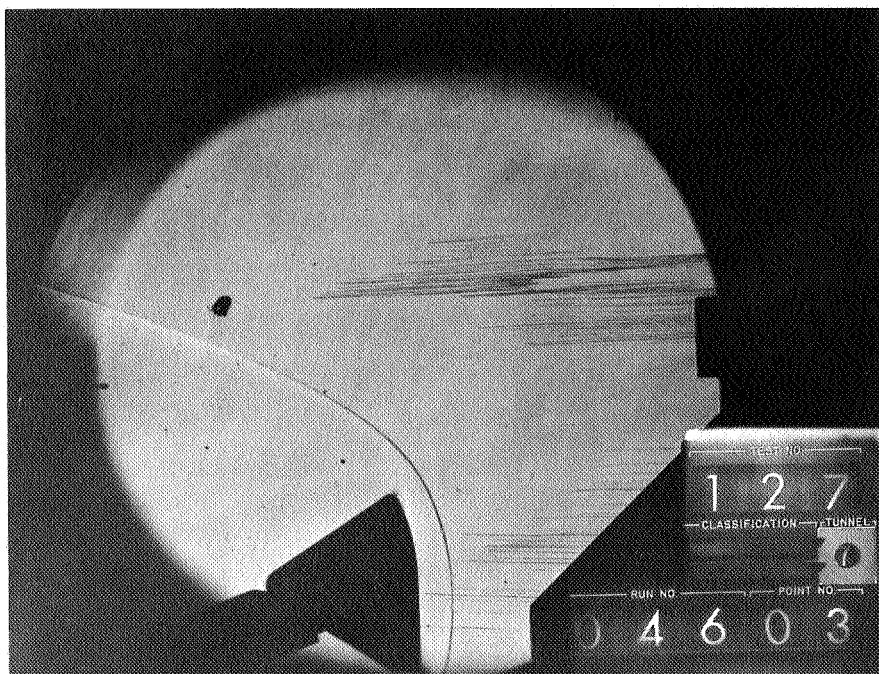
~~CONFIDENTIAL~~~~CONFIDENTIAL~~ $M = 7.3$   
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700-98-193

 $M = 7.3$   
 $\alpha = 180^\circ$ Figure 19.  $C_{31}$  Typical Schlieren~~CONFIDENTIAL~~

~~CONFIDENTIAL~~ $M = 7.3$   
 $\alpha = 120^\circ$ 

700-98-194

 $M = 7.3$   
 $\alpha = 180^\circ$ Figure 20. C<sub>32</sub> Typical Schlieren~~CONFIDENTIAL~~

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## V. REFERENCES

Pretest Report for a 0.02-Scale Apollo Force Model (FS-1) in the JPL Wind Tunnels. NAA/S&ID SID 62-246 (12 February 1962).

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## APPENDIX A

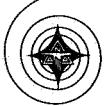
### TABULATED DATA

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## Reduced Data Key

Column	Identification	Units
1	Run/Point	-
2	$\alpha$	Deg
3	$\phi$	Deg
4	$C_N$	-
5	$C_A$	-
6	$C_m$	-
7	$xcp/d$	-
8	$C_Y$	-
9	$C_n$	-
10	$C_\ell$	-
11	$C_L$	-
12	$C_D$	-
13	$C_{m_{cg}}$	-
14	Mach No.	-
15	Reynolds No.	$6 \times 10^{-6}$ /inch
16	-	-

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18-01-66 780127 500011 200000 200000 200000 200000

17001127 200000 200000 200000 200000 200000

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16								
2012.01	+151.38	+180.00	+1176	-1.1792	-0.0200	-1.1701	+	.0107	+	.0045	-	.0001	+	.1616	+	.1.0914	+	.0090	+	.7.33	+	.2708	+	.0090
2012.02	+150.67	+180.00	+1198	-1.1652	-0.0202	-1.1686	+	.0098	+	.0035	+	.0001	+	.1669	+	.1.0754	-	.0068	+	.7.33	+	.2708	+	.0000
2012.03	+146.87	+179.90	+1376	-1.0906	-0.0267	-1.1940	+	.0098	+	.0039	-	.0004	+	.4809	+	.9885	+	.0023	+	.7.33	+	.2710	+	.0000
2012.04	+142.85	+180.00	+1573	-1.0089	-0.0368	-2.2339	+	.0094	+	.0039	+	.0012	+	.4829	+	.8922	+	.0115	+	.7.33	+	.2710	+	.0000
2012.05	+138.82	+179.80	+1742	-9170	-0.0462	-2.2652	+	.0085	+	.0045	-	.0003	+	.4727	+	.8049	+	.0191	+	.7.33	+	.2704	+	.0000
2012.06	+134.79	+179.90	+1966	-8262	-0.0596	-3.032	+	.0072	+	.0036	-	.0004	+	.4478	+	.7216	+	.0264	+	.7.33	+	.2698	+	.0000
2012.07	+130.77	+180.00	+2151	-	-0.0742	-2.4550	+	.0058	+	.0026	-	.0006	+	.4102	+	.6577	+	.0304	+	.7.33	+	.2707	+	.0000
2012.08	+126.74	+180.00	+2594	-6229	-0.0952	-3.2909	+	.0058	+	.0044	+	.0001	+	.3556	+	.0355	+	.7.33	+	.2707	+	.0000		
2012.09	+122.70	+179.80	+2620	-5138	-0.1155	-4.3558	+	.0036	+	.0001	+	.2892	+	.5006	+	.0358	+	.7.33	+	.2705	+	.0000		
2012.10	+142.84	+179.80	+1593	-1.0053	-0.0378	-2.3773	+	.0036	+	.0052	+	.0028	+	.4802	+	.8974	+	.0122	+	.7.33	+	.2705	+	.0000
2012.11	+159.12	+159.12	+2556	-1.2090	-0.1076	-1.2110	+	.0120	+	.0068	-	.0016	+	.1.2207	-	.0057	+	.7.33	+	.2710	+	.0000		

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700127 200014 200000 200216 200000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2014.01 +151.41	+180.10	+	.1226	-	1.2037	+	.0156	+	.1272	+	.0080	+	.0097	+	.4683 + 1.1156 + .0286 + 7.23 + .2712 + .0000
2014.02 +150.71	+180.00	+	.1248	-	1.1834	+	.0152	+	.1218	+	.0062	+	.0015	+	.4731 + 1.0984 + .0306 + 7.33 + .2712 + .0000
2014.03 +147.40	+180.00	+	.1310	-	1.1235	+	.0107	+	.0817	+	.0071	+	.0091	-	.4949 + 1.0171 + .0343 + .2712 + .0000
2014.04 +143.27	+189.90	+	.1479	-	1.0561	+	.0061	+	.0022	+	.0049	+	.0015	+	.5011 + .9189 + .0411 + .2713 + .0000
2014.05 +138.87	+180.00	+	.1603	-	.9462	-	.0075	-	.0468	+	.0071	+	.0007	+	.5017 + .8181 + .0466 + .2714 + .0000
2014.06 +134.83	+179.90	+	.1768	-	.8367	-	.0211	-	.1193	+	.0036	+	.0061	+	.4830 + .7294 + .0496 + .2714 + .0000
2014.07 +130.81	+180.00	+	.1910	-	.7529	-	.0258	-	.1770	+	.0045	+	.0077	+	.4451 + .6367 + .0527 + .2714 + .0000
2014.08 +126.78	+180.00	+	.2137	-	.6156	-	.0559	-	.2616	+	.0040	+	.0072	+	.3891 + .5577 + .0525 + .2714 + .0000
2014.09 +122.74	+180.00	+	.2443	-	.5332	-	.0855	-	.3500	+	.0036	+	.0079	+	.0009 + .3164 + .4939 + .0505 + .2720 + .0000
2014.10 +142.88	+179.00	+	.1473	-	1.0321	+	.0217	+	.0217	+	.0067	+	.0107	-	.0004 + .5054 + .9119 + .0433 + .2721 + .0000
2014.11 +159.16	+179.90	+	.2685	-	1.2237	-	.0723	-	.2767	+	.0084	+	.0104	-	.0009 + .1844 + .1.2391 + .0376 + .2724 + .0000
2014.12 +122.73	+179.90	+	.2448	-	.5313	-	.0849	-	.3468	+	.0054	+	.0102	+	.0010 + .3170 + .4932 + .0517 + .2700 + .0000
2014.13 +122.73	+180.00	+	.2451	-	.5243	-	.0852	-	.3476	+	.0062	+	.0117	+	.0013 + .4951 + .0513 + .2716 + .0000
+3014.14 -00186 +00012 -00001 +00006 -00006 -00001 +00001 +00002 +00003 +00006 +00000															

700127 200015 200000 200205 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
+301501 -00195 +00012 +00003 +00006 +00006 +00000																
2015.02 +159.21	-	.30	+	.0523	-	1.3943	-	.0254	-	.4857	+	.0094	+	.0017	-	.0001 + .4460 + 1.3221 - .0118 + 7.23 + .2712 + .0000
2015.03 +179.24	-	.30	-	.0300	-	.1597	-	.0354	+	.1.1800	+	.0112	+	.0007	-	.0006 + .0512 + 1.5952 - .1501 + 7.33 + .2700 + .0000
2015.04 +175.22	-	.30	-	.0152	-	.1.5869	-	.0340	+	.2.2368	+	.0112	+	.0007	-	.0006 + .1473 + 1.8801 - .1380 + 7.33 + .2706 + .0000
2015.05 +171.23	-	.80	-	.0931	-	.1.5623	-	.0264	+	.9.8065	+	.0112	+	.0007	-	.0009 + .2413 + 1.4555 - .1247 + 7.33 + .2701 + .0000
2015.06 +167.20	+	.00	+	.0130	-	.1.5604	-	.0271	-	.2.0846	+	.0099	-	.0005	+	.0010 + .3241 + 1.4855 - .1079 + 7.33 + .2695 + .0000
2015.07 +163.21	+	.10	+	.0305	-	.1.4653	-	.0252	-	.8361	+	.0108	+	.0013	+	.0013 + .3935 + 1.4097 - .0909 + 7.33 + .2695 + .0000
2015.08 +159.19	+	.10	+	.0519	-	.1.3959	-	.0256	-	.4933	+	.0112	+	.0030	-	.0023 + .4467 + 1.3214 - .0722 + 7.33 + .2707 + .0000
2015.09 +155.18	+	.20	+	.0747	-	.1.3214	-	.0262	-	.3775	+	.0105	+	.0026	-	.0010 + .4869 + 1.2307 - .0549 + 7.33 + .2707 + .0000
2015.10 +151.38	+	.10	+	.0961	-	.1.2463	-	.0222	-	.3251	+	.0112	+	.0048	-	.0026 + .5126 + 1.1400 - .0398 + 7.33 + .2707 + .0000
2015.11 +150.67	+	.10	+	.1001	-	.1.2297	-	.0328	-	.3277	+	.0098	+	.0036	-	.0019 + .5151 + 1.1211 - .0367 + 7.33 + .2708 + .0000
2015.12 +159.20	+	.10	+	.0514	-	.1.3913	-	.0232	-	.4903	+	.0085	+	.0001	-	.0001 + .4461 + 1.3189 - .0721 + 7.33 + .2710 + .0000

700127 200016 200000 200215 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
2016.01 +151.38	+180.00	+	.0974	-	1.2485	-	.0313	-	.3214	+	.0063	-	.0009	+	.0004 + .5125 + 1.1426 - .0382 + 7.33 + .2708 + .0000	
2016.02 +150.69	+180.00	+	.0993	-	1.2334	-	.0325	-	.3273	+	.0065	-	.0012	+	.0010 + .5172 + 1.1241 - .0372 + 7.33 + .2706 + .0000	
2016.03 +146.82	+180.00	+	.1214	-	1.1481	-	.0377	-	.3105	+	.0099	+	.0020	-	.0006 + .5266 + 1.0274 - .0222 + 7.33 + .2702 + .0000	
2016.04 +142.82	+180.00	+	.1434	-	1.0545	-	.0442	-	.3082	+	.0058	-	.0003	+	.0003 + .5230 + 1.0274 - .0269 + 7.33 + .2701 + .0000	
2016.05 +138.82	+180.00	+	.1625	-	.9590	-	.0515	-	.2169	+	.0067	+	.0002	-	.0010 + .5020 + 1.0274 - .0265 + 7.33 + .2704 + .0000	
2016.06 +134.78	+179.90	+	.1843	-	.8556	-	.0629	-	.3413	+	.0036	+	.0000	+	.0000 + .4761 + 1.0274 - .0131 + 7.33 + .2706 + .0000	
2016.07 +130.73	+150.00	+	.2074	-	.7492	-	.0776	-	.3742	+	.0013	-	.0017	+	.0000 + .4724 + 1.0274 - .0204 + 7.33 + .2708 + .0000	
2016.08 +126.72	+180.00	+	.2323	-	.6394	-	.0946	-	.4072	+	.0004	-	.0016	+	.0004 + .5156 + 1.0274 - .0270 + 7.33 + .2710 + .0000	
2016.09 +122.66	+180.00	+	.2613	-	.5212	-	.1166	-	.4462	-	.0018	-	.0032	+	.0003 + .2978 + .5013 + .0318 + 7.33 + .2711 + .0000	
2016.10 +142.84	+180.00	+	.1460	-	.1.0532	-	.0459	-	.3144	+	.0049	+	.0022	+	.0019 + .5198 + .9275 - .0480 + 7.33 + .2704 + .0000	
2016.11 +159.12	+	.10	+	.2301	-	.1.2975	-	.1.2532	-	.5445	+	.0089	+	.0020	-	.0016 + .2474 + 1.2943 - .0441 + 7.33 + .2719 + .0000
2016.12 +159.13	+	.10	+	.2292	-	.1.2935	-	.1.2550	-	.5454	+	.0107	+	.0032	-	.0009 + .2473 + 1.2920 - .0443 + 7.33 + .2700 + .0000
+301613 -00196 -00114 -00002 +00002 +00005 +00000																

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700127 200017 200000 2000205 2000000 2000000 200000

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
+301701. -00194.	-00001	-00001	-00000	+00000	-00000	+00001	-00001	-00000	+00000	-00000	.00058	-00054	+00054	.00058	-00000		
2017.02 +159.20	-	.10	+	.0549	-1.3925	-	.0261	-	.4754	+	.0134	+	.00358	-	.00000		
2017.03 +179.23	+	.10	-	.0269	1.5928	-	.0359	+1.3346	+	.0139	+	.0038	-	.0007	+	.00000	
2017.04 +175.23	+	.10	-	.0130	-1.5645	-	.0341	+2.6231	+	.0139	+	.0038	-	.0007	+	.00000	
2017.05 +171.23	+	.10	+	.0090	-1.5636	-	.0307	+	.0080	+	.0148	-	.0052	-	.0007	+	.00000
2017.06 +167.22	+	.10	+	.0161	-1.5215	-	.0287	-1.7826	+	.0125	+	.0036	-	.0010	+	.00000	
2017.07 +163.21	-	.10	+	.0327	-1.4641	-	.0262	-	.8012	+	.0134	+	.0051	-	.0010	+	.00000
2017.08 +159.21	+	.00	+	.0756	-1.3966	-	.0256	-	.6689	+	.0143	+	.0070	-	.0016	+	.00000
2017.09 +155.18	+	.10	-	.0756	-1.3916	-	.0277	-	.3664	+	.0130	+	.0068	-	.0019	+	.00000
2017.10 +151.28	-	.20	+	.0988	-1.2435	-	.0327	-	.3310	+	.0112	+	.0052	-	.0009	+	.00000
2017.11 +158.67	-	.20	+	.0243	-1.2102	-	.0276	-	.2927	+	.0107	-	.0054	-	.0020	+	.00000

700127 200018 200000 200215 200000 200000 200000

700127 2000019 200000 2000207 2000000 2000000 2000000

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700127 2000020 2000000 2002017 2000000 2000000 2000000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
2020.01	+151.12	+180.00	+	.1109	-	1.2838	+	.0112	+	.1019	+	.0027	+	.007	+	.5168 + 1.1805 + .0116 + .2704 + .0000
2020.02	+150.72	+180.00	+	.1126	-	1.2703	+	.0102	+	.0906	+	.0018	+	.0019	+	.5231 + 1.1631 + .0124 + .2705 + .0000
2020.03	+146.91	+180.00	+	.1280	-	1.1887	+	.0064	+	.0500	+	.0027	+	.0033	-	.0013 + 1.0658 + .0240 + .2709 + .0000
2020.04	+142.88	+179.90	+	.1396	-	.0963	-	.0007	-	.0050	+	.0051	+	.0039	+	.5503 + .9584 + .0203 + .2709 + .0000
2020.05	+138.87	+179.30	+	.1525	-	.9969	-	.0064	-	.0420	+	.0031	+	.0039	+	.5408 + .8512 + .0394 + .2709 + .0000
2020.06	+134.84	+180.00	+	.1658	-	.8975	-	.0191	-	.1152	+	.0027	+	.0043	+	.5195 + .7505 + .0416 + .2712 + .0000
2020.07	+120.81	+180.00	+	.1850	-	.7914	-	.0321	-	.1789	+	.0018	+	.0036	+	.4781 + .6572 + .0470 + .2715 + .0000
2020.08	+126.78	+180.00	+	.2082	-	.6781	-	.0537	-	.2579	+	.0004	+	.0014	+	.4784 + .5728 + .0490 + .2715 + .0000
2020.09	+122.73	+180.00	+	.2419	-	.5582	-	.0832	-	.3439	+	.0018	+	.0057	+	.0010 + .3398 + .5053 + .0497 + .2713 + .0000
2020.10	+142.89	+180.00	+	.1397	-	.0959	-	.0003	-	.0021	+	.0031	+	.0055	+	.0013 + .5498 + .9585 + .0308 + .2713 + .0000
2020.11	+159.15	+.00	+	.2562	-	1.3209	-	.0842	-	.3286	+	.0019	+	.0059	-	.0009 + .2307 + 1.3256 + .0136 + 7.33 + .2707 + .0000
+302012	-00193 -00005	+00001 +00004 +00002 +00000														

700127 2000021 2000000 2002008 2000000 2000000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2021.01	-002023 -00003	+00003 +00001 -0000008	+0000001 -0000001												
2021.02	+159.14	-	.10	+	.1439	-	1.3310	-	.1075	-	.7470	+	.0045	+	.0077 - .0004 + .3395 + 1.2950 - .0674 + .2710 + .0000
2021.03	+179.15	+	.00	+	.0770	-	1.4238	-	.1077	-	1.3987	+	.0021	+	.0060 - .0004 - .0557 + 1.4347 - .1395 + .2704 + .0000
2021.04	+175.16	+	.00	+	.0903	-	1.4319	-	.1082	-	1.1982	+	.0049	+	.0074 - .0010 + .0308 + 1.4344 - .1307 + .2702 + .0000
2021.05	+171.15	+	.00	+	.1032	-	1.4316	-	.1091	-	1.0572	+	.0060	+	.0067 - .0007 + .1183 + 1.4305 - .1228 + .2710 + .0000
2021.06	+167.15	+	.00	+	.1130	-	1.4073	-	.1060	-	.9281	+	.0036	+	.0062 - .0006 + .2028 + 1.3976 - .1115 + .2711 + .0000
2021.07	+162.16	+	.10	+	.1275	-	1.3566	-	.1063	-	.8357	+	.0036	+	.0064 - .0004 + .2768 + 1.3545 - .1002 + .2712 + .0000
2021.08	+159.15	+	.00	+	.1459	-	1.3376	-	.1083	-	.7423	+	.0036	+	.0059 - .0000 + .3398 + 1.3019 - .0872 + 7.23 + .2714 + .0000
2021.09	+155.13	+	.00	+	.1638	-	1.2846	-	.1110	-	.6777	+	.0036	+	.0021 - .0004 + .2921 + 1.2353 - .0745 + .2708 + .0000
2021.10	+151.32	-	.30	+	.1812	-	1.2267	-	.1145	-	.6319	+	.0031	+	.0067 - .0009 + .4297 + 1.1632 - .0626 + 7.33 + .2707 + .0000
2021.11	+150.63	-	.30	+	.1827	-	1.2113	-	.1145	-	.6267	+	.0031	+	.0065 - .0001 + .4349 + 1.1452 - .0606 + 7.33 + .2705 + .0000

700127 2000021 2000000 2002008 2000000 2000000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+3C21C1	-C0203 -CCC3	+00003 +00001 -000008	+0000001 +0000001 +0000000												
2021.C2	+159.14	-	.10	+	.1425	+	1.3516	-	.1075	-	.7470	+	.0045	+	.0077 - .0004 + .3395 + 1.2950 - .0874 + 7.33 + .2710 + .0000
2021.03	+178.15	+	.00	+	.0770	-	1.4338	-	.1077	-	1.3987	+	.0031	+	.0060 - .0004 - .0557 + 1.4347 - .1295 + .2704 + .0000
2021.04	+175.16	+	.00	+	.0903	-	1.4319	-	.1082	-	1.1982	+	.0049	+	.0074 - .0010 + .0308 + 1.4344 - .1307 + 7.33 + .2702 + .0000
2021.05	+171.15	+	.00	+	.1032	-	1.4316	-	.1091	-	1.0572	+	.0040	+	.0067 - .0007 + .1183 + 1.4305 - .1228 + .2710 + .0000
2021.06	+167.15	+	.00	+	.1130	-	1.4073	-	.1060	-	.9381	+	.0036	+	.0062 - .0006 + .2028 + 1.3972 - .1115 + .2711 + .0000
2021.07	+163.16	-	.10	+	.1275	-	1.5566	-	.1053	-	.8337	+	.0036	+	.0062 - .0004 + .2768 + 1.2545 - .1002 + 7.33 + .2712 + .0000
2021.08	+159.15	+	.00	+	.1459	-	1.3376	-	.1085	-	.7423	+	.0036	+	.0059 - .0000 + .3398 + 1.3019 - .0872 + 7.33 + .2714 + .0000
2021.09	+155.13	+	.00	+	.1638	-	1.2856	-	.1110	-	.6777	+	.0062	+	.0091 - .0004 + .3921 + 1.2553 - .0745 + 7.33 + .2708 + .0000
2021.10	+151.32	-	.30	+	.1812	-	1.2267	-	.1145	-	.6319	+	.0031	+	.0067 - .0009 + .4297 + 1.1632 - .0626 + 7.33 + .2707 + .0000
2021.11	+150.63	-	.30	+	.1827	-	1.2113	-	.1145	-	.6267	+	.0031	+	.0065 - .0001 + .4349 + 1.1452 - .0606 + 7.33 + .2705 + .0000

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700127 200022 200000 200208 200000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2022.01 +150.62 -	10 +	.1844 -	1.2116 -	.1139 -	.6177 +	.0021 +	.0058 -	.0007 +	.4237 +	1.1463 -	.0590 +	.7.33 +	.2700 +	.0000	
2022.02 +151.31 -	10 +	.1800 -	1.2242 -	.1137 -	.5317 +	.0040 +	.0067 -	.0012 +	.4298 +	1.1603 -	.0625 +	.7.33 +	.2659 +	.0000	
2022.03 +155.14 -	20 +	.1631 -	1.2858 -	.1106 -	.6781 +	.0036 +	.0061 -	.0004 +	.3286 +	1.2353 -	.0746 +	.7.33 +	.2697 +	.0000	
2022.04 +159.14 +	00 +	.1458 -	1.3362 -	.1082 -	.7021 +	.0026 +	.0058 +	.0001 +	.3356 +	1.3005 -	.0870 +	.7.33 +	.2702 +	.0000	
2022.05 +163.16 +	00 +	.1291 -	1.3748 -	.1068 -	.8823 +	.0015 +	.0068 +	.0007 +	.2747 +	1.2522 -	.0923 +	.7.22 +	.2705 +	.0000	
2022.06 +167.15 +	00 +	.1134 -	1.4049 -	.1061 -	.9256 +	.0049 +	.0074 -	.0009 +	.2018 +	1.3949 -	.1112 +	.7.33 +	.2712 +	.0000	
2022.07 +171.15 -	10 +	.1025 -	1.4219 -	.1069 -	.10429 +	.0049 +	.0072 -	.0006 +	.1175 +	1.4208 -	.1205 +	.7.33 +	.2718 +	.0000	
2022.08 +175.15 +	10 +	.0904 -	1.4275 -	.1070 -	1.1836 +	.0040 +	.0066 -	.0007 +	.0506 +	1.4300 -	.1292 +	.7.33 +	.2719 +	.0000	
2022.09 +179.14 +	10 +	.0776 -	1.4327 -	.1076 -	1.3866 +	.0049 +	.0073 -	.0006 -	.0561 +	1.4337 -	.1389 +	.7.33 +	.2699 +	.0000	
2022.10 +159.14 +	00 +	.1469 -	1.3344 -	.1081 -	.7359 +	.0045 +	.0077 -	.0006 +	.3279 +	1.2992 -	.0861 +	.7.33 +	.2691 +	.0000	

700127 200023 200000 200218 200000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2023.01 +151.31 +	180.10 +	.1811 -	1.2217 -	.1125 -	.6212 +	.0022 +	.0056 -	.0000 +	.4276 +	1.1586 -	.0604 +	.7.33 +	.2709 +	.0000	
2023.02 +150.62 +	180.00 +	.1852 -	1.2133 -	.1131 -	.6107 +	.0031 +	.0072 +	.0003 +	.4238 +	1.1481 -	.0578 +	.7.33 +	.2708 +	.0000	
2023.03 +146.80 +	180.00 +	.2044 -	1.1428 -	.1175 -	.5749 -	.0004 +	.0036 -	.0000 +	.4548 +	1.0681 -	.0448 +	.7.33 +	.2708 +	.0000	
2023.04 +142.80 +	180.00 +	.2222 -	1.0633 -	.1229 -	.5531 +	.0018 +	.0051 +	.0010 +	.4659 +	.9813 -	.0932 +	.7.33 +	.2708 +	.0000	
2023.05 +138.78 -	180.00 +	.2402 -	.9763 -	.1380 -	.5412 +	.0000 +	.0035 +	.0012 +	.4626 +	.8927 -	.0929 +	.7.33 +	.2707 +	.0000	
2023.06 +134.75 +	180.00 +	.2589 -	.8781 -	.1375 -	.5311 -	.0013 -	.0025 +	.0010 +	.4413 +	.8021 -	.0118 +	.7.33 +	.2707 +	.0000	
2023.07 +130.71 -	180.00 +	.2814 -	.7847 -	.1499 -	.5327 -	.0004 +	.0033 +	.0006 +	.4113 +	.7251 -	.0033 +	.7.33 +	.2706 +	.0000	
2023.08 +126.70 +	180.00 +	.3019 -	.6838 -	.1634 -	.5412 -	.0018 +	.0025 +	.0014 +	.3679 +	.6508 +	.0032 +	.7.23 +	.2705 +	.0000	
2023.09 +122.67 +	180.00 +	.3221 -	.5741 -	.1787 -	.5518 -	.0018 +	.0038 +	.0007 +	.3029 +	.5810 +	.0083 +	.7.33 +	.2705 +	.0000	
2023.10 +142.80 +	180.00 +	.2247 -	1.0661 -	.1265 -	.5670 +	.0000 +	.0054 +	.0015 +	.4656 +	.9851 -	.0353 +	.7.33 +	.2705 +	.0000	
2023.11 +159.05 -	10 +	.3268 -	1.2306 -	.2117 -	.6478 +	.0045 +	.0083 +	.0010 +	.1348 +	1.2660 -	.0603 +	.7.33 +	.2708 +	.0000	
+302312 -00202 -00007 +00001 +00000 +00000															

700127 200024 200000 200209 200000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+302401 -00217 -00001 +00004 +00003 +00001 +00000															
2024.02 +159.15 +	00 +	.00 +	.1749 -	.17565 -	.1046 -	.5981 +	.0071 +	.0071 -	.0010 +	.3134 +	1.3300 -	.0647 +	.7.33 +	.2713 +	.0000
2024.03 +179.16 +	00 +	.1156 +	.11395 -	.1062 -	.9187 +	.0058 +	.0052 -	.0006 -	.0945 +	1.4410 -	.1119 +	.7.33 +	.2713 +	.0000	
2024.04 +175.15 -	10 +	.1290 -	1.4419 -	.1071 -	.8302 +	.0067 +	.0058 -	.0007 -	.0066 +	1.4476 -	.1037 +	.7.33 +	.2712 +	.0000	
2024.05 +177.16 +	00 +	.1415 -	1.4545 -	.1067 -	.7541 +	.0067 +	.0052 -	.0010 +	.0806 +	1.4390 -	.0943 +	.7.33 +	.2712 +	.0000	
2024.06 +167.15 +	00 +	.1501 -	1.4180 -	.1045 -	.6962 +	.0063 +	.0054 -	.0004 +	.1691 +	1.4159 -	.0853 +	.7.33 +	.2706 +	.0000	
2024.07 +163.15 +	00 +	.1626 -	1.3921 -	.1034 -	.6339 +	.0080 +	.0078 -	.0013 +	.2479 +	1.3794 -	.0749 +	.7.33 +	.2711 +	.0000	
2024.08 +159.14 +	00 +	.1762 -	1.3555 -	.1045 -	.5864 +	.0071 +	.0078 -	.0030 +	.3162 +	1.3501 -	.0623 +	.7.33 +	.2706 +	.0000	
2024.09 +155.13 +	00 +	.1898 -	1.3072 -	.1061 -	.5606 +	.0089 +	.0087 +	.0010 +	.3776 +	1.2658 -	.0534 +	.7.33 +	.2706 +	.0000	
2024.10 +151.32 +	00 +	.2031 -	1.2473 -	.1073 -	.5283 +	.0067 +	.0075 -	.0007 +	.4204 +	1.1918 -	.0416 +	.7.33 +	.2707 +	.0000	
2024.11 +158.62 +	00 +	.2013 -	1.2259 -	.1045 -	.5191 +	.0058 +	.0065 -	.0001 +	.2595 +	1.2149 -	.0388 +	.7.33 +	.2707 +	.0000	

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SID 62-1256

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700127 200025 200000 200219 2000000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						
2025.01	+151.33	+180.00	+	2063	-1.2545	-	1072	-	2220	+	0042	+	4209	+ 1.1997	-	0404	+ 7.33	+ 2706	+ .0000		
2025.02	+150.62	+179.90	+	2077	-1.2420	-	1082	+	0049	+	.0051	-	0003	+ 1.1842	-	.0391	+ 7.33	+ 2706	+ .0000		
2025.03	+157.62	+110.00	+	2242	-1.1808	-	1124	-	5013	+	.0004	+	.0015	+ 1.1773	-	.0285	+ 7.33	+ 2706	+ .0000		
2025.04	+161.25	+79.90	+	2371	-1.0982	-	1156	-	4876	+	.0000	+	.0009	+ 1.1161	-	.0178	+ 7.33	+ 2706	+ .0000		
2025.05	+138.79	+179.90	+	2497	-1.0975	-	1188	-	4758	+	.0009	+	.0025	+ 1.1161	-	.0178	+ 7.33	+ 2706	+ .0000		
2025.06	+134.78	+179.80	+	2639	-	9160	-	1244	-	4714	+	.0045	+	.0054	-	.0000	+ 1.1773	+ 7.33	+ 2706	+ .0000	
2025.07	+130.72	+180.90	+	2814	-	8112	-	1554	-	4812	+	.0040	+	.0059	+ 1.1161	-	.0178	+ 7.33	+ 2706	+ .0000	
2025.08	+126.72	+179.90	+	3003	-	7153	-	1194	-	4975	+	.0027	+	.0049	+ 1.1161	-	.0178	+ 7.33	+ 2706	+ .0000	
2025.09	+122.69	+179.90	+	3225	-	6038	-	1662	-	5153	+	.0027	+	.0058	+ 1.1161	-	.0178	+ 7.33	+ 2706	+ .0000	
2025.10	+142.80	+179.90	+	2381	-1.0942	-	1149	-	4826	+	.0045	+	.0062	+ 1.1161	-	.0178	+ 7.33	+ 2706	+ .0000		
2025.11	+159.06	-.00	+	3649	-1.2496	-	2169	-	5294	+	.0063	+	.0064	-	.0006	+ 1.1295	-	.0178	+ 7.33	+ 2706	+ .0000
+302512	-00218	-00002	+00003	+00001	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000		

700127 200032 200000 200300 200000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16							
+303201	+00000	+00000	-000001	-000002	-000002	+000001	+000000	+000000	+000000	+000000	+000000	+000000	+000000	+000000	+000000							
2032.02	+160.09	+	.20	+	.2802	-1.3896	-	.2108	-	.7523	+	.0049	+	.0062	+ 1.4019	-	.1006	+ 7.33	+ 2716	+ .0000		
2032.04	+159.01	+	.00	-	.0114	-	.0114	-	.0450	+	3.9474	-	.0031	-	.0016	+ 1.1013	-	.2187	+ 7.30	+ 2737	+ .0000	
2032.05	+179.02	+	.00	-	.0295	-	.2579	-	.0311	+	1.0614	-	.0022	-	.0020	+ 1.0177	-	.0357	+ 7.30	+ 2737	+ .0000	
2032.06	+159.08	+	.00	+	.2786	-1.3543	-	.2069	-	.7426	+	.0066	+	.0084	-	.0000	+ 1.3645	-	.0958	+ 7.30	+ 2743	+ .0000
2032.07	+179.09	+	.00	+	.2119	-1.3868	-	.1992	-	.9401	+	.0052	+	.0057	+ 1.2960	-	.1899	+ 1.3645	+ 2743	+ .0000		
2032.08	+175.08	+	.00	+	.2252	-1.3968	-	.2038	-	.9022	+	.0044	+	.0054	-	.0012	+ 1.1053	-	.1314	+ 7.30	+ 2743	+ .0000
2032.09	+171.08	+	.00	+	.2449	-1.4039	-	.2079	-	.8489	+	.0044	+	.0048	+ 1.1849	-	.0242	+ 1.1228	+ 2743	+ .0000		
2032.10	+167.08	+	.00	+	.2576	-1.3965	-	.2091	-	.8117	+	.0048	+	.0061	+ 1.1181	-	.0611	+ 1.1148	+ 2743	+ .0000		
2032.11	+163.07	-	.10	-	.2650	-1.3808	-	.2076	-	.7834	+	.0057	+	.0078	-	.0003	+ 1.1482	-	.1074	+ 7.30	+ 2743	+ .0000
2032.12	+159.07	+	.00	+	.2789	-1.3533	-	.2076	-	.7434	+	.0057	+	.0081	-	.0010	+ 1.2229	-	.0962	+ 7.30	+ 2748	+ .0000
2032.13	+155.07	+	.10	+	.2896	-1.3211	-	.2053	-	.7192	+	.0065	+	.0079	-	.0008	+ 1.2945	-	.0877	+ 7.30	+ 2750	+ .0000
2032.14	+151.25	+	.10	+	.3002	-1.2754	-	.2090	-	.6962	+	.0065	+	.0094	-	.0003	+ 1.3503	-	.0784	+ 7.30	+ 2749	+ .0000
2032.15	+150.37	+	.00	+	.3014	-1.2631	-	.2076	-	.6888	+	.0065	+	.0092	-	.0001	+ 1.3581	-	.0755	+ 7.30	+ 2745	+ .0000

700127 200033 200000 200310 200000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16							
2033.01	+151.26	+180.00	+	3023	-1.2810	-	2085	-	.6897	+	.0074	+	.0108	+	.0000	+ 1.2509	-	.0768	+ 7.30	+ 2745	+ .0000	
2033.02	+150.56	+180.00	+	3037	-1.2710	-	2079	-	.6846	+	.0085	+	.0115	-	.0001	+ 1.2602	-	.0746	+ 7.30	+ 2741	+ .0000	
2033.03	+146.76	+179.80	+	3161	-1.2119	-	2078	-	.6574	+	.0070	+	.0101	-	.0009	+ 1.3999	-	.0636	+ 7.30	+ 2729	+ .0000	
2033.04	+142.74	+179.80	+	3295	-1.1503	-	2113	-	.6413	+	.0035	+	.0090	+	.0017	+ 1.4342	-	.0532	+ 7.30	+ 2730	+ .0000	
2033.05	+138.73	+179.80	+	3399	-1.0690	-	2110	-	.6208	+	.0022	+	.0061	+	.0009	+ 1.4496	-	.0410	+ 7.30	+ 2731	+ .0000	
2033.06	+134.72	+179.80	+	3505	-	.9829	-	.2117	-	.6040	+	.0057	+	.0091	+	.0004	+ 1.4518	-	.0294	+ 7.30	+ 2731	+ .0000
2033.07	+130.68	+179.80	+	3658	-	.8887	-	.2180	-	.5560	+	.0048	+	.0084	+	.0004	+ 1.4256	-	.0196	+ 7.30	+ 2735	+ .0000
2033.08	+126.68	+179.70	+	3763	-	.7895	-	.2233	-	.5934	+	.0044	+	.0081	+	.0006	+ 1.4084	-	.0734	+ 7.30	+ 2730	+ .0000
2033.09	+122.65	+179.80	+	3965	-	.6873	-	.2360	-	.5952	+	.0053	+	.0095	+	.0007	+ 1.3648	-	.0046	+ 7.30	+ 2735	+ .0000
2033.10	+142.74	+180.00	+	3265	-1.1416	-	2084	-	.6383	+	.0079	+	.0122	-	.0006	+ 1.4313	-	.0519	+ 7.30	+ 2732	+ .0000	
2033.11	+158.97	-.06	+	4821	-1.2367	-	3334	-	.6816	+	.0048	+	.0076	-	.0004	+ 1.3273	-	.0758	+ 7.30	+ 2737	+ .0000	
+303312	+00000	+00002	-00003	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000	+00000			

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700127 200034 200000 200301 200000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+303401 -00266 +00335 +00001	+00002 -00003 +00002 +00000														
2034.02 +158.99 + .00 + .3879 - 1.3699 -	.3183 - .8206 + .0035 + .0047 - .0066 + .1291 + 1.4179 -														
2034.03 +179.01 + .10 + .2990 - 1.3521 -	.2906 - .9719 + .0040 + .0024 - .0010 - .2756 + 1.3571 -														
2034.04 +175.01 + .10 + .3243 - 1.3704 -	.3023 - .3211 + .0031 + .0019 - .0011 - .2059 + 1.3934 -														
2034.05 +170.99 + .10 + .3458 - 1.3827 -	.3116 - .3026 + .0026 + .0017 - .0014 - .1250 + 1.4198 -														
2034.06 +167.02 + .10 + .3642 - 1.3884 -	.3171 - .8707 + .0018 + .0009 - .0009 - .0431 + 1.4348 -														
2034.07 +163.00 + .10 + .3755 - 1.3856 -	.3186 - .3865 + .0026 + .0021 - .0007 + .0460 + 1.4348 -														
2034.08 +159.00 + .10 + .3861 - 1.3682 -	.3184 - .8247 + .0018 + .0023 - .0001 + .1298 + 1.4157 -														
2034.09 +154.99 + .00 + .3984 - 1.3458 -	.3189 - .8005 + .0044 + .0053 - .0001 + .2680 + 1.3880 -														
2034.10 +151.19 + .00 + .4055 - 1.3078 -	.3177 - .7835 + .0044 + .0054 - .0006 + .2749 + 1.3413 -														
2034.11 +150.49 + .00 + .4100 - 1.3054 -	.3186 - .7771 + .0035 + .0047 - .0007 + .2862 + 1.3581 -														

700127 200035 200000 200311 200000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2035.01 +151.19 +180.10 + .4159 - 1.3191 -	.3204 - .7704 + .0062 + .0083 - .0001 + .2713 + 1.3562 -														
2035.02 +150.49 +180.10 + .4153 - 1.3067 -	.3188 - .7667 + .0062 + .0081 + .0000 + .2838 + 1.3420 -														
2035.03 +146.67 +180.00 + .4244 - 1.2647 -	.3201 - .7512 + .0062 + .0077 + .0016 + .3403 + 1.2899 -														
2035.04 +142.68 +180.00 + .4339 - 1.1972 -	.3134 - .7223 + .0066 + .0086 - .0003 + .3807 + 1.2152 -														
2035.05 +138.67 +180.00 + .4436 - 1.1326 -	.3147 - .7094 + .0031 + .0057 - .0001 + .4149 + 1.1435 -														
2035.06 +134.65 +180.00 + .4463 - 1.0492 -	.6921 + .5089 - .6921 + .0046 + .0046 + .4368 + 1.0548 -														
2035.07 +130.63 +180.00 + .4577 - 9658 -	.5109 - .6793 + .0026 + .0056 - .0003 + .4350 + .9763 -														
2035.08 +126.64 +180.00 + .4650 - .8727 -	.5095 - .6656 + .0035 + .0060 - .0003 + .4228 + .8939 -														
2035.09 +122.61 +180.00 + .4757 - .7646 -	.5140 - .6601 + .0031 + .0065 + .0001 + .3877 + .8128 -														
2035.10 +142.67 +180.00 + .4381 - 1.2035 -	.3186 - .7272 + .0022 + .0056 + .0014 + .3844 + 1.2227 -														
2035.11 +158.88 + .00 + .6086 - 1.2410 -	.4595 - .7550 + .0026 + .0054 - .0019 + .1205 + 1.3769 -														
+303512 -00267 +00357 -00001 +00006 +00007 +00000															

700127 200038 200000 200203 200000 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+303601 -00183 +00008 +00001 +00005 +00003 +00000															
2036.02 +159.18 + .00 + .0724 - 1.2814 -	.0463 - .6395 + .0000 - .0017 + .0006 + .3877 + 1.2234 -														
2036.03 +179.21 + .00 + .0171 - 1.4327 -	.0392 + 2.2924 - .0031 - .0078 + .0011 + .1220 + 1.4189 -														
2036.04 +175.21 + .00 - .0031 - 1.4242 -	.0386 + 12.4516 - .0022 - .0056 + .0009 + .2019 + 1.3928 -														
2036.05 +171.20 + .00 + .0136 - 1.4073 -	.0391 - 2.8750 - .0013 - .0056 + .0008 + .2744 + 1.3471 -														
2036.06 +167.21 - .10 + .0307 - 1.3744 -	.0400 - 1.3029 - .0004 - .0058 + .0006 + .1001 + 1.3471 -														
2036.07 +163.19 + .00 + .0484 - 1.3319 -	.0420 - .8678 + .0004 - .0026 + .0010 + .3289 + 1.2890 -														
2036.08 +159.17 + .00 + .0730 - 1.2814 -	.0471 - .6452 - .0009 - .0027 + .0016 + .3875 + 1.2236 -														
2036.09 +155.17 - .10 + .0979 - 1.2216 -	.0527 - .5383 + .0009 - .0011 + .0006 + .4241 + 1.1498 -														
2036.10 +151.25 + .00 + .1188 - 1.1539 -	.0584 - .4916 + .0018 + .0006 + .0003 + .4489 + 1.0696 -														
2036.11 +150.95 + .00 + .1225 - 1.3719 -	.0598 - .4800 + .0004 - .0004 + .0003 + .4509 + 1.0518 -														

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16														
<u>700127 200042 200000 200204 200000 200000 200000</u>																														
+304201 -90187 +00007 +00003 +00000 -00001 +00000	2042.02 +159.22	+	.00	+	.0622	-	1.3784	-	.0148	-	.2379	+	.0022	+	.0009	+	.0000	+	.4308	+	1.2108	-	.0235	+	7.30	+	.2744	+	.0000	
2042.03 +179.25	-	.10	-	.0088	-	1.5510	-	.0209	+	2.3750	+	.0009	-	.0028	+	.0006	+	.0006	+	.0291	+	1.5508	-	.1184	+	7.30	+	.2740	+	.0000
2042.04 +175.25	+	.00	+	.0026	-	1.5397	-	.0186	-	7.1538	+	.0000	-	.0034	+	.0004	+	.1249	+	1.5346	-	.1077	+	7.30	+	.2741	+	.0000		
2042.05 +171.23	+	.00	+	.0136	-	1.5179	-	.0156	-	1.1471	+	.0009	-	.0020	+	.0006	+	.0006	+	.2180	+	1.5023	-	.0958	+	7.30	+	.2731	+	.0000
2042.06 +167.24	+	.00	+	.0277	-	1.4957	-	.0126	-	.4910	+	.0004	+	.0026	+	.0004	+	.0001	+	.2011	+	1.4547	-	.0822	+	7.30	+	.2729	+	.0000
2042.07 +163.23	-	.10	-	.0444	-	1.4381	-	.0124	-	.2793	+	.0022	+	.0001	+	.0031	+	.3724	+	1.3897	-	.0668	+	7.30	+	.2735	+	.0000		
2042.08 +159.22	+	.00	+	.0632	-	1.3783	-	.0142	-	.2247	+	.0048	+	.0024	+	.0011	+	.4299	+	1.3110	-	.0222	+	7.30	+	.2738	+	.0000		
2042.09 +155.20	+	.00	+	.0833	-	1.3104	-	.0178	-	.2137	+	.0039	+	.0020	+	.0004	+	.4740	+	1.2245	-	.0380	+	7.30	+	.2736	+	.0000		
2042.10 +151.39	+	.00	+	.0990	-	1.2337	-	.0216	-	.2182	+	.0044	+	.0013	+	.0004	+	.5039	+	1.1305	-	.0265	+	7.30	+	.2726	+	.0000		
2042.11 +150.69	+	.00	+	.1048	-	1.2229	-	.0232	-	.2214	+	.0035	+	.0026	+	.0003	+	.5073	+	1.1176	-	.0255	+	7.30	+	.2735	+	.0000		

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
700127	200043	200000	200214	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000	200000			
2043.01	+151.39	+180.00	+	.0988	-1.2414	-	.0217	-	.2174	+	.0044	+	.0051	+	.5068	+1.1376	-		
2043.02	+150.70	+180.00	+	.1012	-1.2260	-	.0230	-	.2318	+	.0025	+	.0054	+	.5091	+1.0216	-		
2043.03	+146.87	+180.00	+	.1119	-1.1419	+	.0277	-	.2306	+	.0038	+	.0001	+	.5240	+1.0216	+		
2043.04	+142.85	+180.10	+	.1409	-1.0523	-	.0353	-	.2505	+	.0022	+	.0033	+	.5232	+ .9238	-		
2043.05	+138.83	+179.30	+	.1561	-1.0527	-	.0436	-	.2793	+	.0009	+	.0016	+	.5097	+ .8200	+		
2043.06	+134.81	+179.30	+	.1790	-	.0571	-	.2196	+	.0018	+	.0020	+	.0004	+	.7310	+ .0149	+	
2043.07	+130.79	+179.70	+	.2019	-	.7530	-	.3576	+	.0013	+	.0028	+	.0003	+	.4382	+ .6448	+	
2043.08	+126.76	+179.80	+	.2256	-	.6409	-	.0912	-	.4043	+	.0022	+	.0045	+	.3785	+ .5643	+	
2043.09	+122.70	+179.80	+	.2526	-	.5242	-	.1153	-	.4565	+	.0026	+	.0054	+	.3046	+ .4958	+	
2043.10	+118.66	+179.80	+	.1403	-1.0480	-	.0351	-	.2502	+	.0040	+	.0063	+	.0011	+	.5210	+ .9901	+
2043.11	+115.14	+179.90	+	.2322	-1.2771	-	.1112	-	.4811	+	.0041	+	.0040	+	.0006	+	.2378	+1.2761	+
+304312	-00188	+000007	+000001	+000003	+000000												+0218 + 1.2711 -		

~~CONFIDENTIAL~~



700127 200046 200000 200320 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+304601 -00195 +00011 +00005 +00002 +00001 +00000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.02 +159.16 +00 .00 + *1686 - 1.4573 - .0565 + .0000 + .0007 + .3608 + 1.4220 - 1.059 + 7.31 + .2729 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.03 +170.15 +00 .10 + *1366 - 1.5036 - .1076 - 1.0983 + .0026 - .0004 + .0004 + .0004 + .0004 + .0004 + .0004 + .0004 + .0004 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.04 +175.13 - .10 + *1417 - 1.5089 - 1.1448 - 1.0219 - .0018 - .0027 + .0004 + .0131 + 1.5155 - .1366 + 7.31 + .2724 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.05 +171.14 +00 .10 + *1479 - 1.5102 - .1420 - .0001 + .0004 + .0003 + .0003 + .0003 + .0003 + .0003 + .0003 + .0003 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.06 +167.16 +00 .10 + *1505 - 1.4979 - 1.1362 - .9050 + .0009 + .0013 - .0001 + .0013 + .0009 + .0009 + .0009 + .0009 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.07 +169.15 +00 .10 + *1585 - 1.4824 - .1344 - .0018 + .0016 + .0009 + .0009 + .0009 + .0009 + .0009 + .0009 + .0009 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.08 +159.15 +00 .10 + *1695 - 1.4577 - 1.1553 - .7982 + .0026 + .0004 + .0011 + .0011 + .0011 + .0011 + .0011 + .0011 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.09 +155.15 +00 .10 + *1722 - 1.4187 - 1.1368 - .7534 + .0035 + .0019 + .0006 + .4336 + 1.3626 - .1051 + 7.31 + .2719 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.10 +151.33 +00 .10 + *1863 - 1.3743 - .1400 - .7515 + .0035 + .0059 + .0004 + .4958 + 1.2952 - .0934 + 7.31 + .2724 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2046.11 +150.62 +00 .10 + *1903 - 1.3681 - .1419 - .7457 + .0026 + .0043 + .0000 + .5054 + 1.2855 - .0921 + 7.31 + .2724 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

700127 200047 200000 200321 200000 200000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2047.01 +151.33 +180.00 +1885 - 1.3822 - 1.1410 - 7.480 + .0026 + .0052 + .0001 + .4977 + 1.3031 - .0933 + 7.31 + .2729 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.02 +150.64 +180.00 +1912 - 1.3747 - .1416 - .7406 + .0018 + .0044 + .0004 + .5074 + 1.2918 - .0916 + 7.31 + .2729 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.03 +147.07 +170.70 +2056 - 1.3125 - .1453 - .7152 + .0004 + .0017 + .0007 + .5435 + 1.2117 - .0838 + 7.31 + .2724 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.04 +142.78 +180.00 +2132 - 1.2167 - 1.1459 - .6883 + .0022 + .0049 + .0000 + .5662 + 1.0979 - .0715 + 7.31 + .2724 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.05 +158.78 +180.00 +2199 - 1.1081 - 1.1438 - .6539 + .0022 + .0044 + .0006 + .5648 + .9784 - .0584 + 7.31 + .2728 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.06 +134.75 +180.00 +2278 - .9862 - .1430 - .6277 + .0026 + .0053 - .0006 + .5400 + .8561 - .0450 + 7.31 + .2729 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.07 +130.76 +180.00 +2331 - .8687 - .1464 - .6015 + .0013 + .0040 + .0001 + .4991 + .7516 - .0308 + 7.31 + .2728 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.08 +126.73 +180.00 +2606 - .7473 - .1454 - .5925 + .0040 + .0069 + .0004 + .4450 + .6558 - .0199 + 7.31 + .2728 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.09 +122.69 +180.00 +2778 - .6113 - .1466 - .5925 + .0026 + .0067 + .0004 + .3615 + .5640 - .0104 + 7.31 + .2728 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.10 +142.80 +180.00 +2111 - 1.2141 - 1.1461 - .6291 + .0040 + .0083 - .0004 + .5659 + 1.0947 - .0730 + 7.31 + .2723 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2047.11 +159.06 +00 .00 +3458 - 1.3612 - .2393 - .6390 - .0009 + .0010 - .0003 + .1637 + 1.3949 - .0825 + 7.31 + .2723 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
+304712 -00194 +00010 +00003 +00002 +00001 +00000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

700127 200048 200000 200002 200000 200000

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+304801 -00191 +00012 +00005 +00002 +00001 +00000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.02 +159.20 - .10 + *0776 - 1.2774 - .0067 - .0863 + .0093 + .0020 - .0011 + .3811 + 1.2217 - .0289 + 7.31 + .2731 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.03 +179.23 - .10 + *0889 - 1.4523 - .0082 - .9213 + .0071 - .0034 - .0004 + .0104 + 1.4523 - .0866 + 7.31 + .2717 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.04 +175.22 - .10 + *0217 - 1.4236 - .0079 + .2611 + .0071 - .0035 - .0009 + .0070 + 1.4204 - .0770 + 7.31 + .2716 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.05 +171.20 - .10 + *0411 - 1.4059 - .0062 - .1818 + .0080 - .0017 - .0012 + .1814 + 1.3946 - .0657 + 7.31 + .2716 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.06 +167.18 - .10 + *0491 - 1.3777 - .0055 - .1120 + .0066 - .0029 - .0004 + .0258 + 1.3545 - .0531 + 7.31 + .2718 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.07 +163.19 - .20 + *0605 - 1.3550 - .0052 - .0860 + .0081 - .0003 - .0020 + .0326 + 1.2935 - .0423 + 7.31 + .2722 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.08 +159.17 - .10 + *0791 - 1.2786 - .0075 - .0948 + .0064 + .0006 - .0016 + .3808 + 1.2231 - .0287 + 7.31 + .2723 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.09 +155.20 - .20 + *0954 - 1.2149 - .0109 - .1143 + .0079 + .0019 - .0019 + .4250 + 1.1429 - .0172 + 7.31 + .2724 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.10 +151.38 - .10 + *1120 - 1.1503 - .0173 - .1515 + .0071 + .0013 - .0017 + .4527 + 1.0633 - .0081 + 7.31 + .2726 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2048.11 +150.67 - .10 + *1161 - 1.1411 - .0193 - .1662 + .0088 + .0027 - .0019 + .4578 + 1.0517 - .0071 + 7.31 + .2725 + .0000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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700127 200049 200000 200012 2000000 200000 2000000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
2049.01	+150.38	+180.00	+ 1150	- 1.1589	- .0171	- .1513	+	.0071	- .0016	- .0000	+ .4555	+ 1.0714	- .0080	+ 7.31	+ .2714 + .0000
2049.02	+150.68	+180.00	+ 1153	- 1.1453	- .0184	- 1526	+	.0077	- .0040	- .0000	+ 1.0551	- .0069	+ 7.31	+ .2722 + .0000	
2049.03	+146.86	+180.00	+ 1332	- 1.0700	- .0255	- 1916	+	.0049	- .0000	+ .0000	+ 4.735	+ .9688	+ .0027	+ 7.31	+ .2726 + .0000
2049.04	+152.83	+180.00	+ 1513	- .9893	- .0349	- 2262	+	.0031	- .0006	+ .0004	+ 4.747	+ .8815	+ .0126	+ 7.31	+ .2719 + .0000
2049.05	+158.81	+180.00	+ 1694	- .8946	- .0129	- 2532	+	.0062	+ .0019	- .0001	+ 4.616	+ .7848	+ .0204	+ 7.31	+ .2719 + .0000
2049.06	+134.80	+180.00	+ 1906	- .8088	- .0567	- 2975	+	.0035	- .0001	- .0001	+ 4.396	+ .7051	+ .0263	+ 7.31	+ .2719 + .0000
2049.07	+150.79	+180.10	+ 2101	- .7120	- .0708	- 3370	+	.0022	- .0003	+ .0001	+ 4.018	+ .6242	+ .0312	+ 7.31	+ .2714 + .0000
2049.08	+120.71	+180.00	+ 2331	- .6026	- .0896	- 3844	+	.0013	- .0010	+ .0001	+ 3.775	+ .5503	+ .0344	+ 7.31	+ .2719 + .0000
2049.09	+122.66	+180.00	+ 2588	- .4955	- .1112	- 4297	- .0009	+ .0017	+ .0003	+ .0003	+ 2775	+ .4853	+ .0370	+ 7.31	+ .2718 + .0000
2049.10	+142.84	+180.10	+ 1562	- .9875	- .0356	- 2279	+	.0075	+ .0015	+ .0015	+ 1720	+ .8814	+ .0132	+ 7.31	+ .2718 + .0000
2049.11	+159.12	+ 10	+ 2512	- 1.1803	- .1054	- 4196	+	.0093	+ .0032	- .0019	+ 1.860	+ 1.1923	- .0028	+ 7.31	+ .2719 + .0000
2049.12	+159.12	+ 10	+ 2512	- 1.1829	- .1052	- 4188	+	.0084	+ .0004	- .0011	+ 1.869	+ 1.1947	- .0028	+ 7.31	+ .2714 + .0000
+304913 - 00192 +00010 +00005 +00003 +00008 +00001 +00000															

700127 200050 200000 200002 200000 2000000

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+305001	- 00190	+00014	- 00001	- 00002	- 00001	- 00002	- 00000	- 00000	- 00000	- 00000	- 00000	- 00000	- 00000	- 00000	- 00000
+305002	- 00191	+00014	- 00001	- 00001	- 00001	- 00000	+ 00000	+ 00000	+ 00000	+ 00000	+ 00000	+ 00000	+ 00000	+ 00000	+ 00000
2050.03	+160.21	+ 00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00
2050.04	+156.21	+ 1.20	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00
2050.05	+160.21	+ 00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00
2050.06	+160.21	+ 00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00
2050.07	+160.21	+ 00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00
2050.08	+160.21	+ 00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00
2050.09	+160.21	+ 00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00
2050.10	+160.21	+ 00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00
2050.11	+160.21	+ 00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00
2050.12	+160.21	+ 00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00	+ .00

A-12

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NORTH AMERICAN AVIATION, INC.

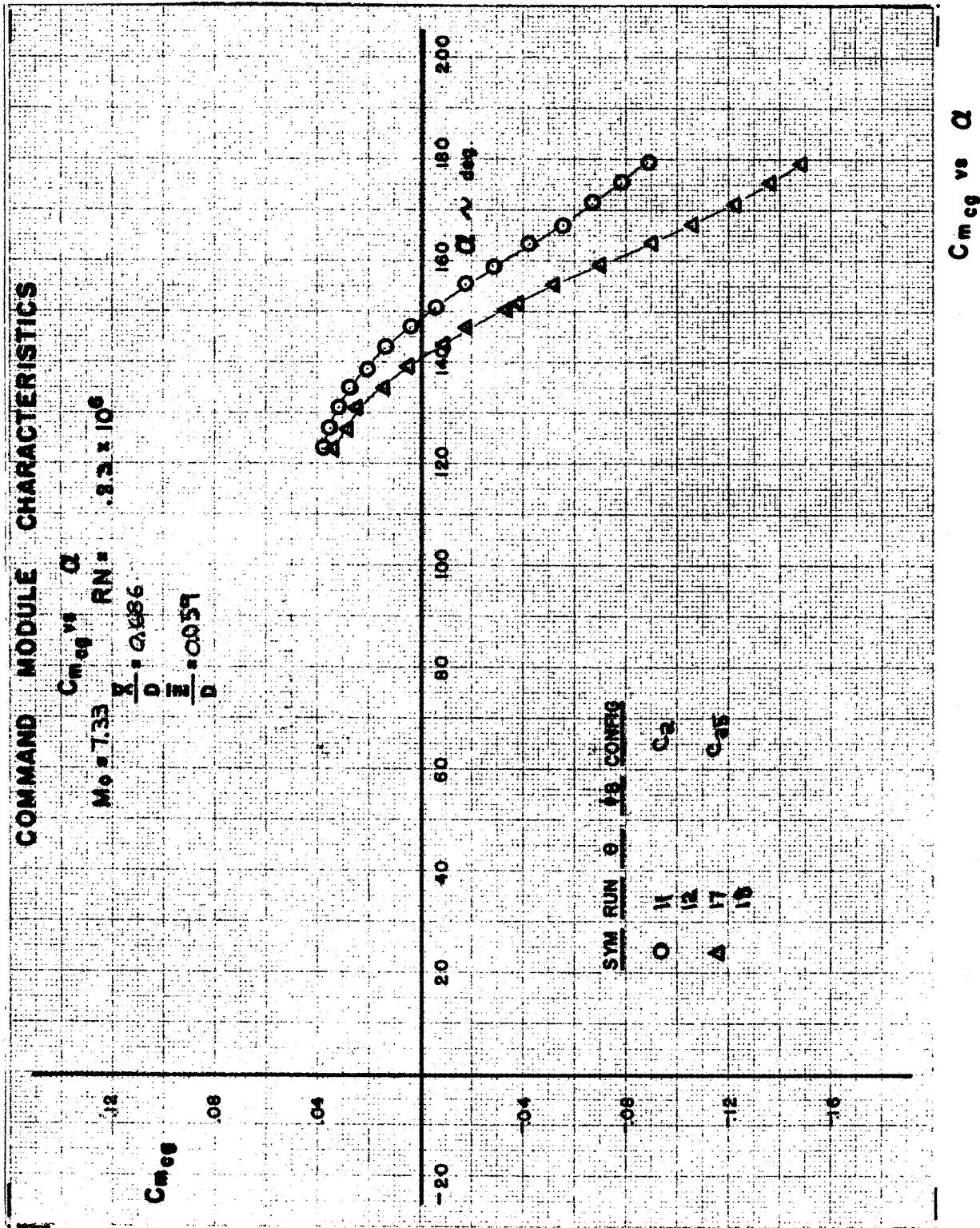


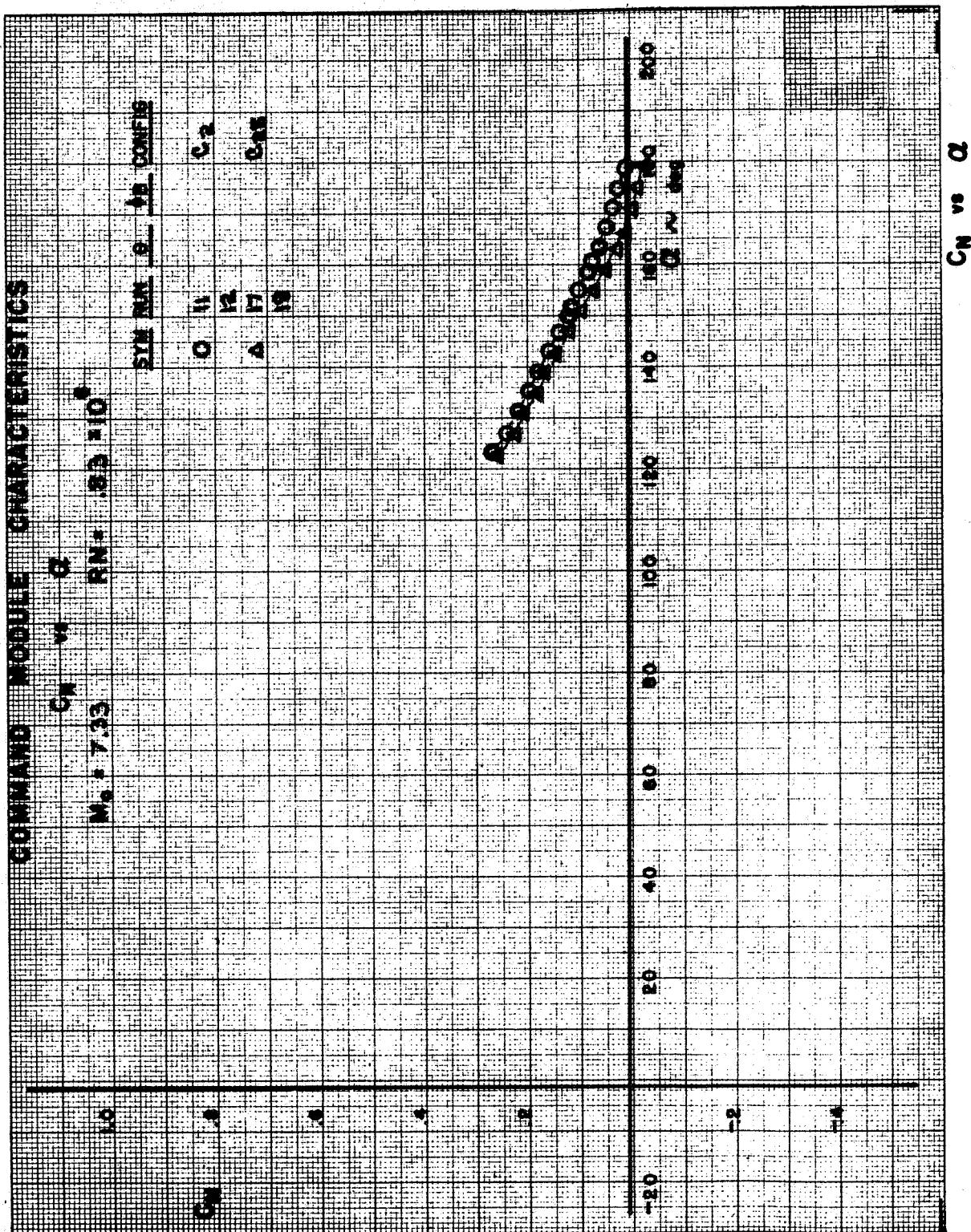
SPACE and INFORMATION SYSTEMS DIVISION

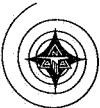
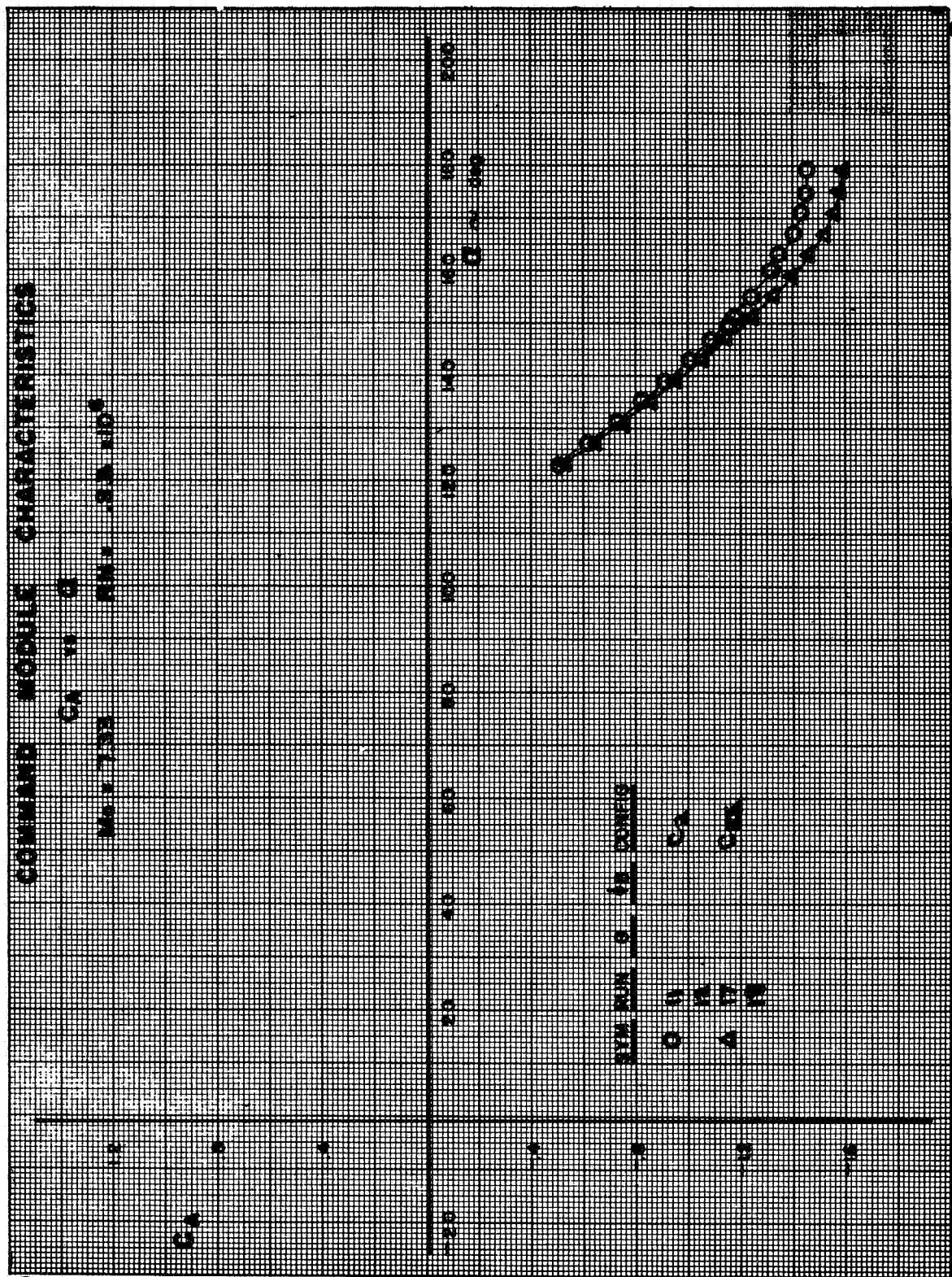
## APPENDIX B PLOTTED DATA

B-1

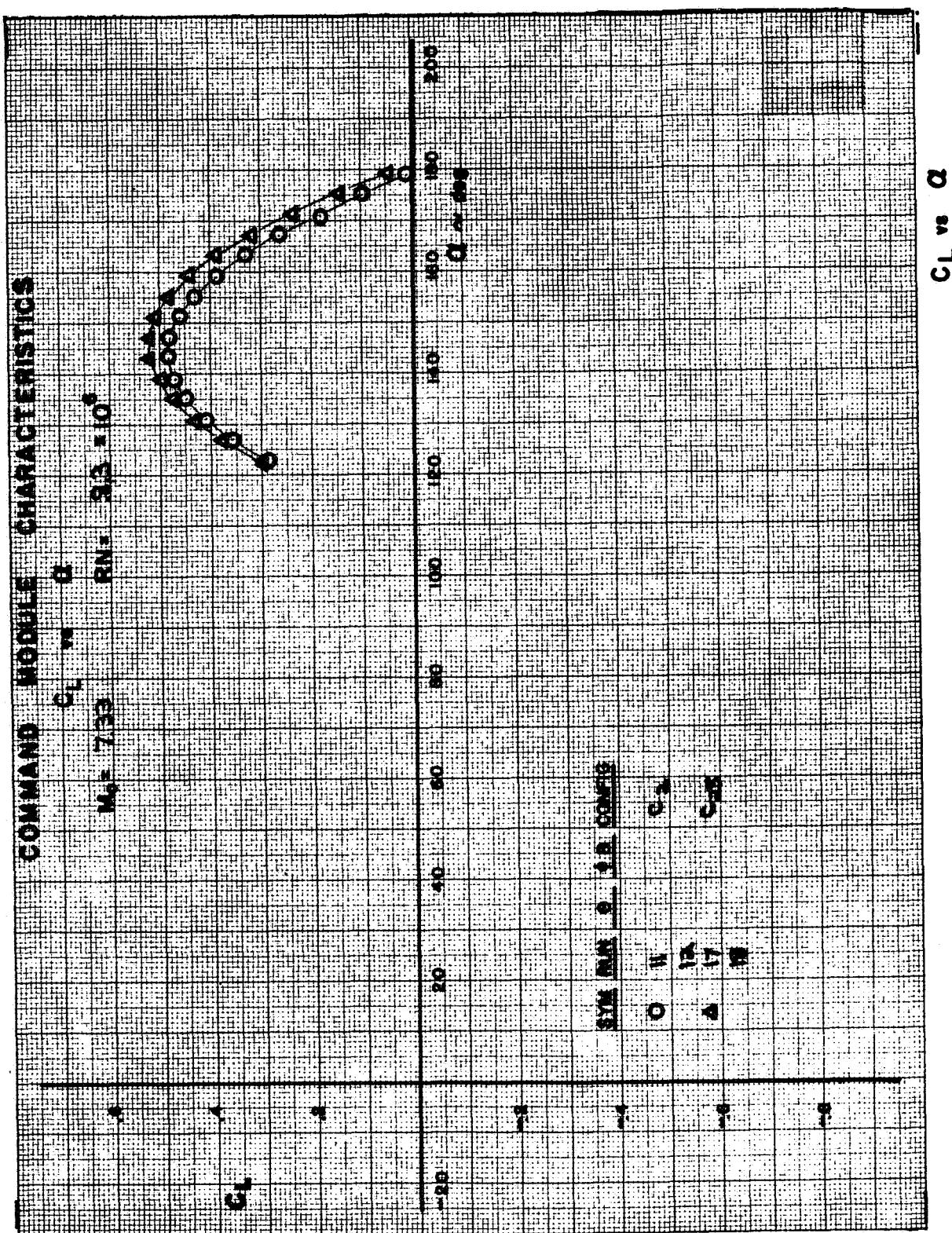
CONFIDENTIAL  
SID 62-1256

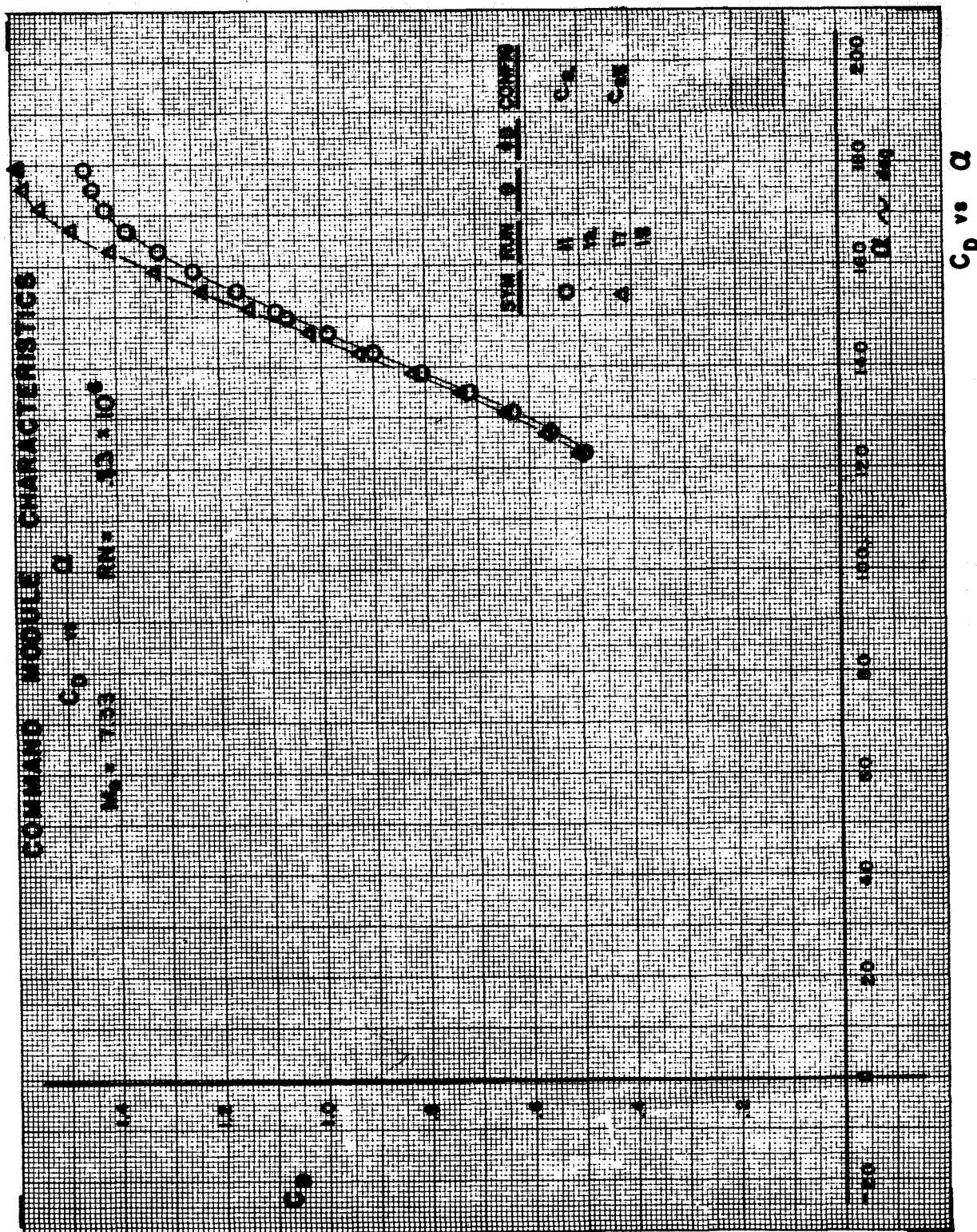
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California



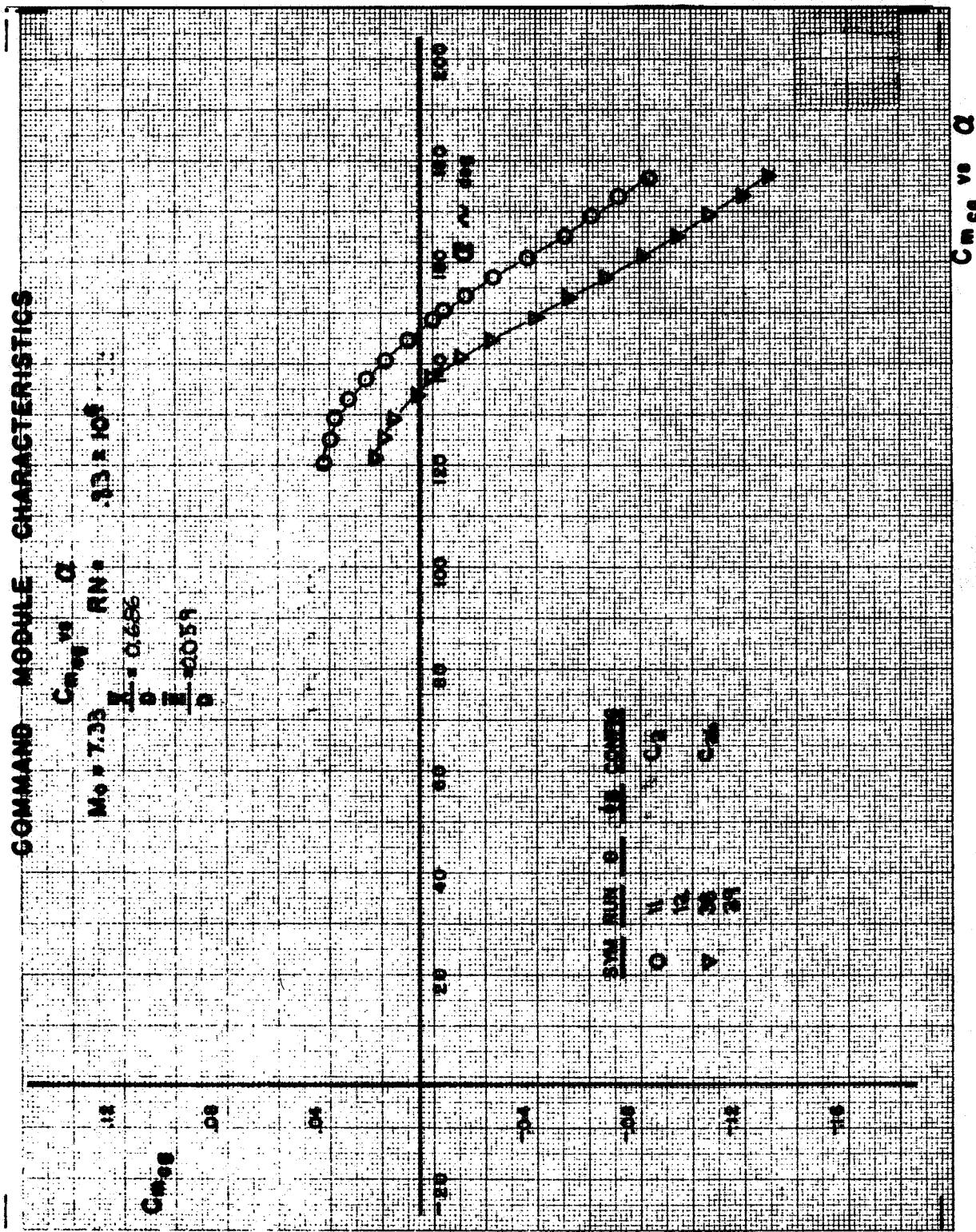


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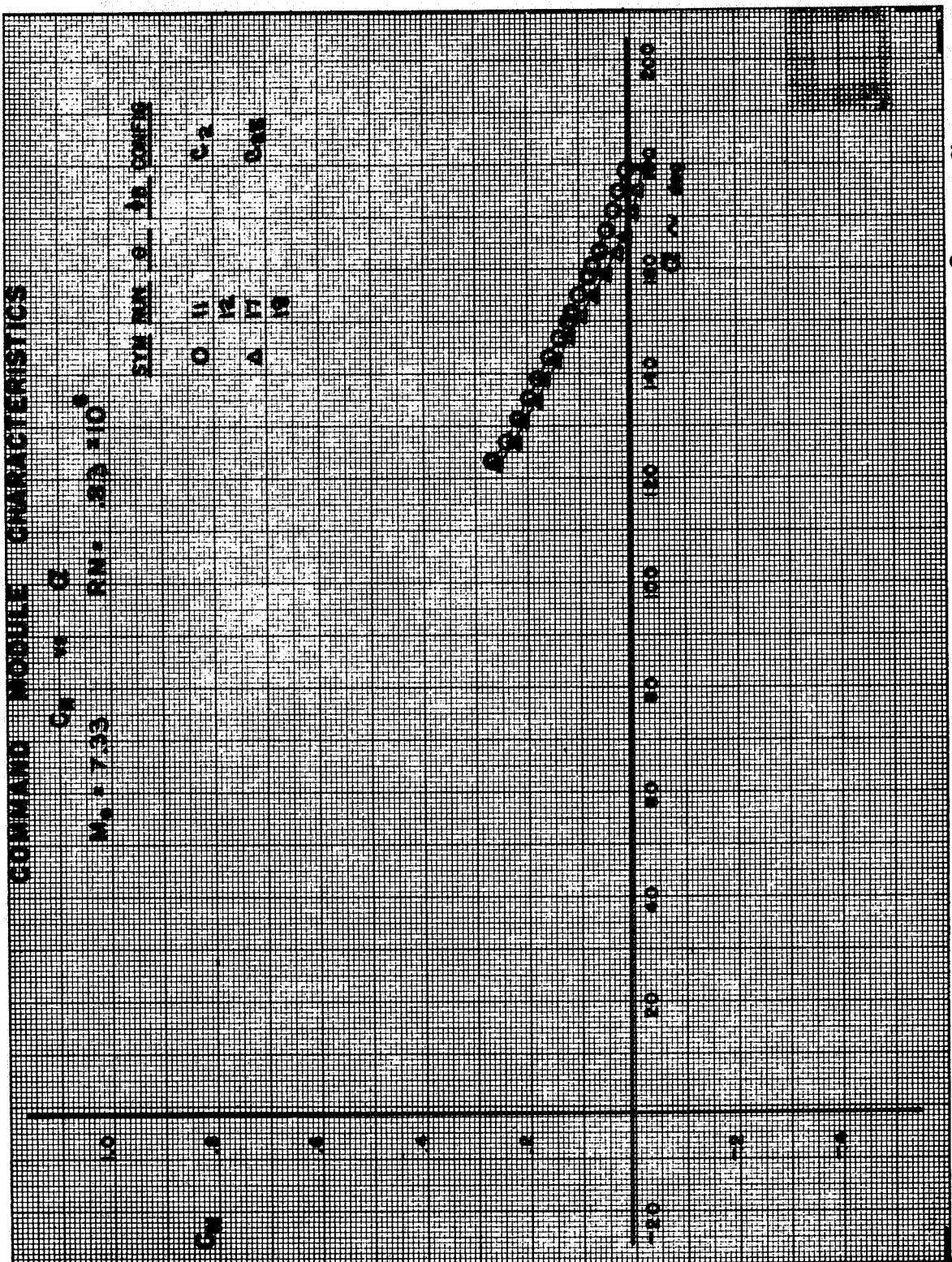


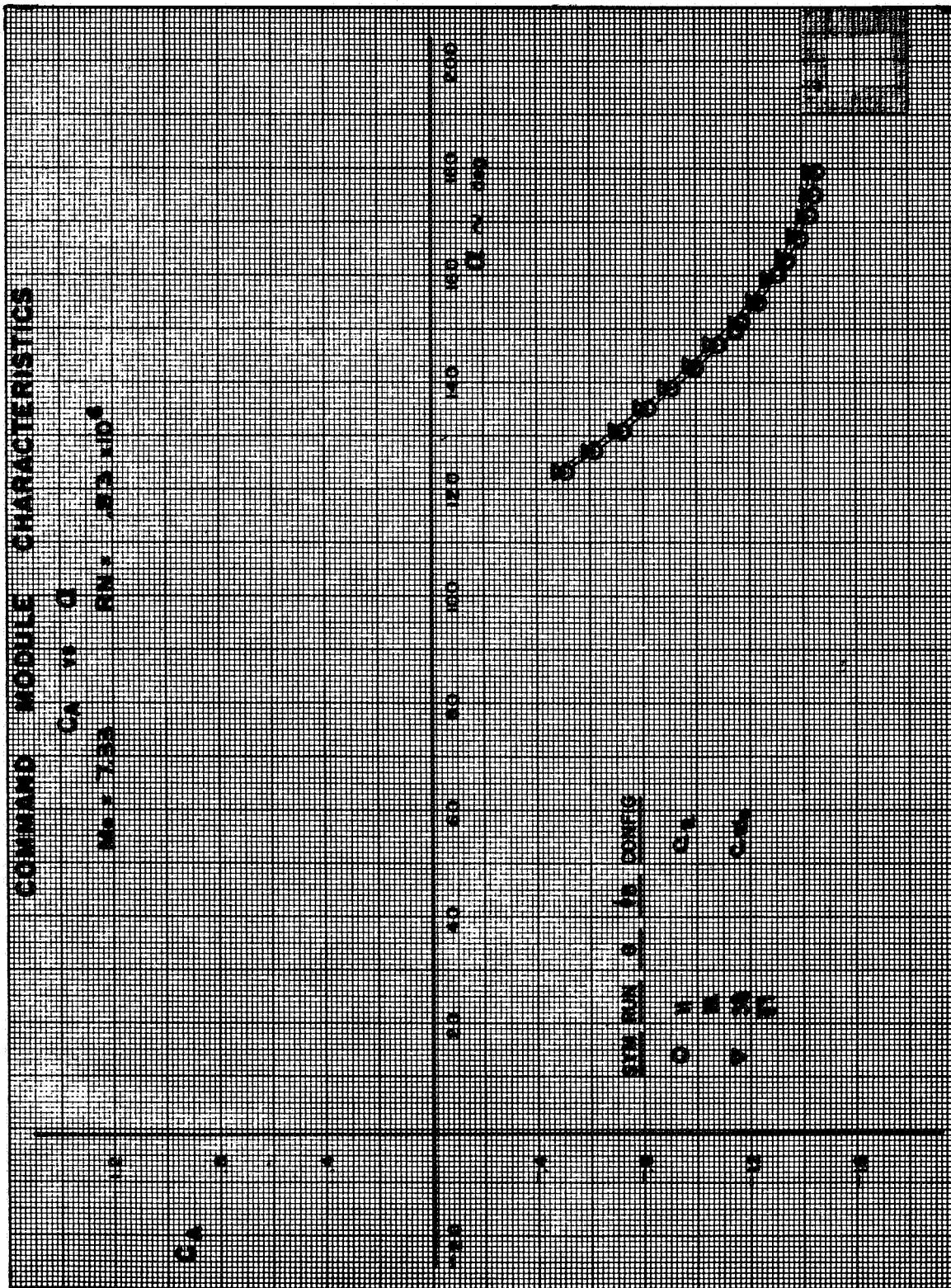


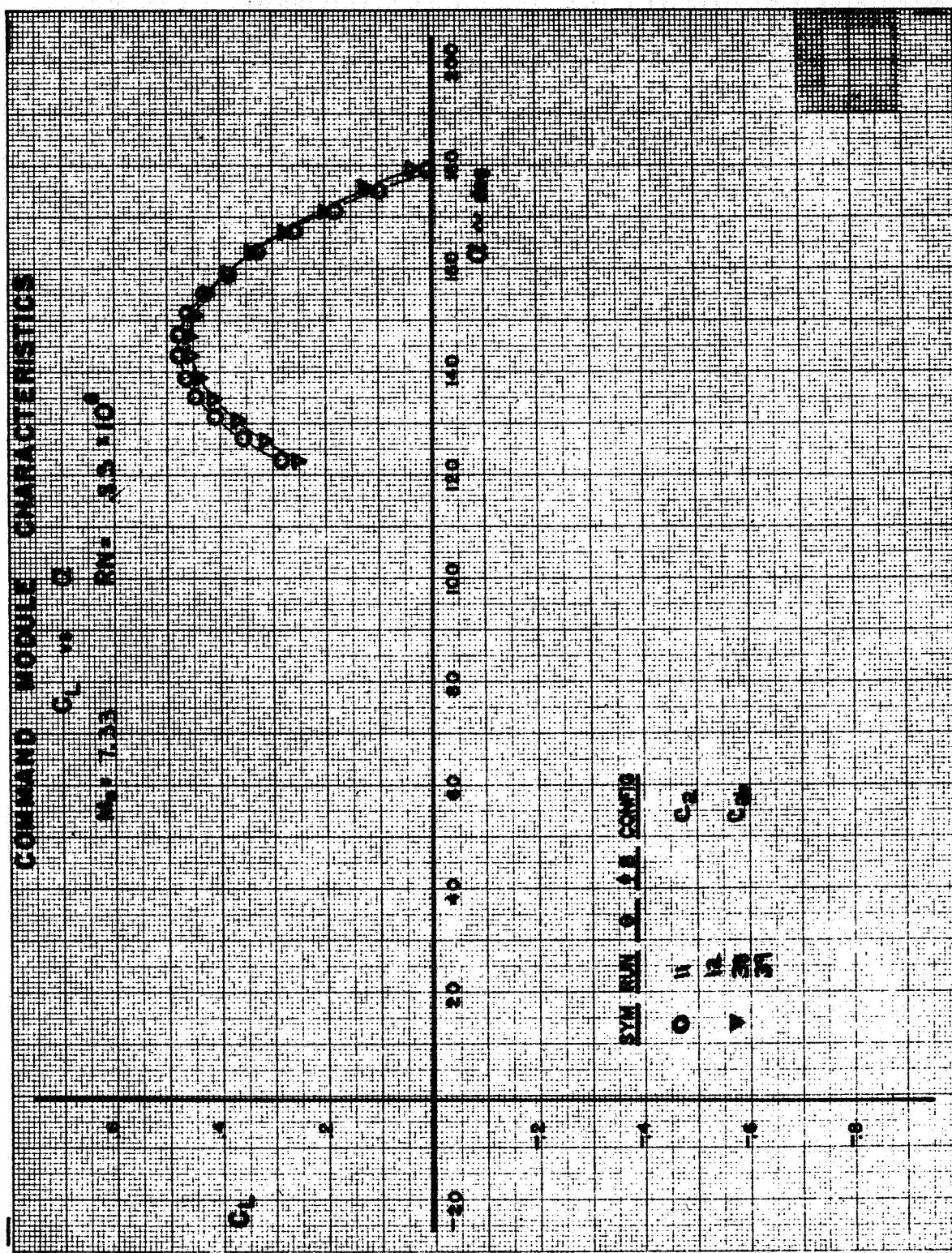
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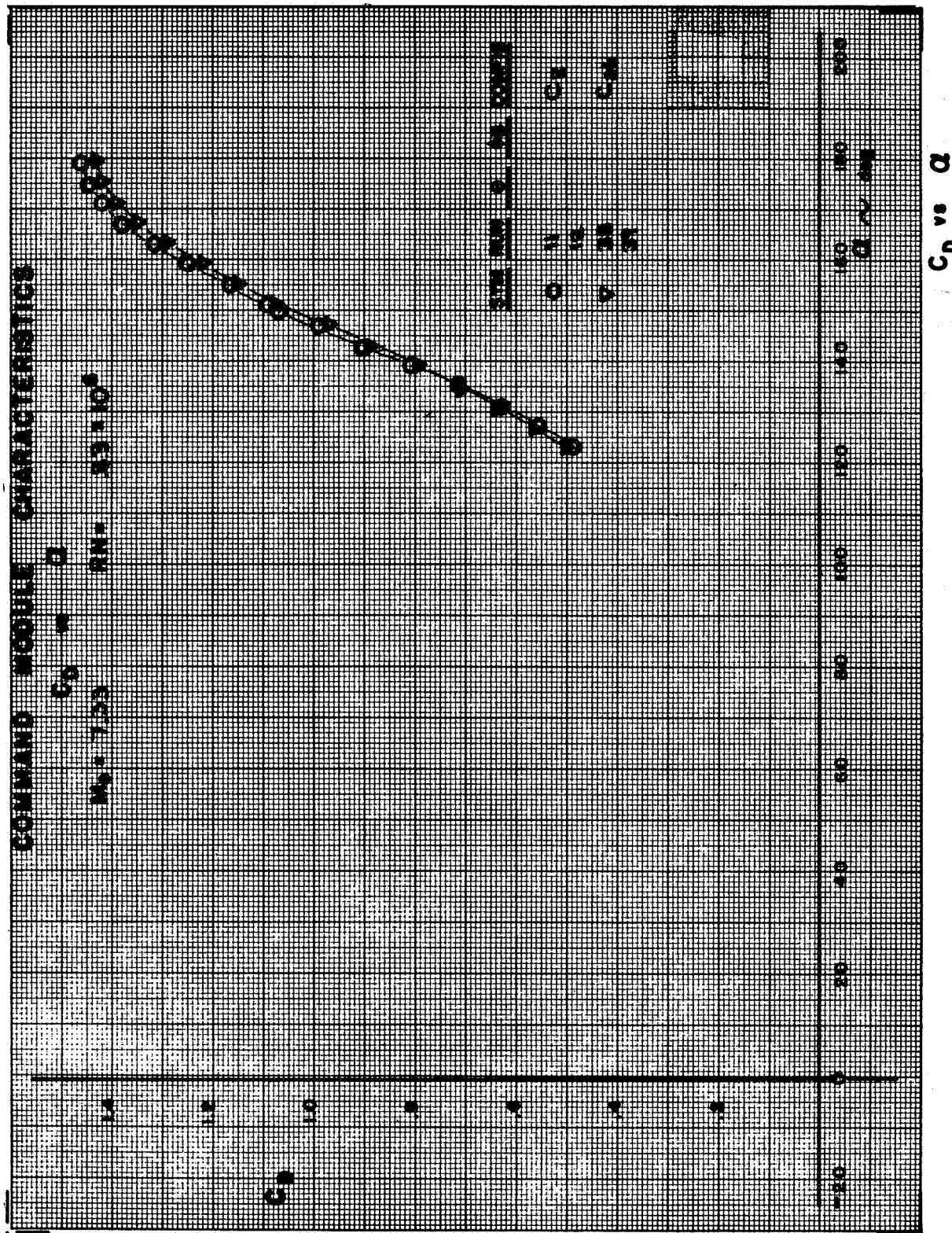
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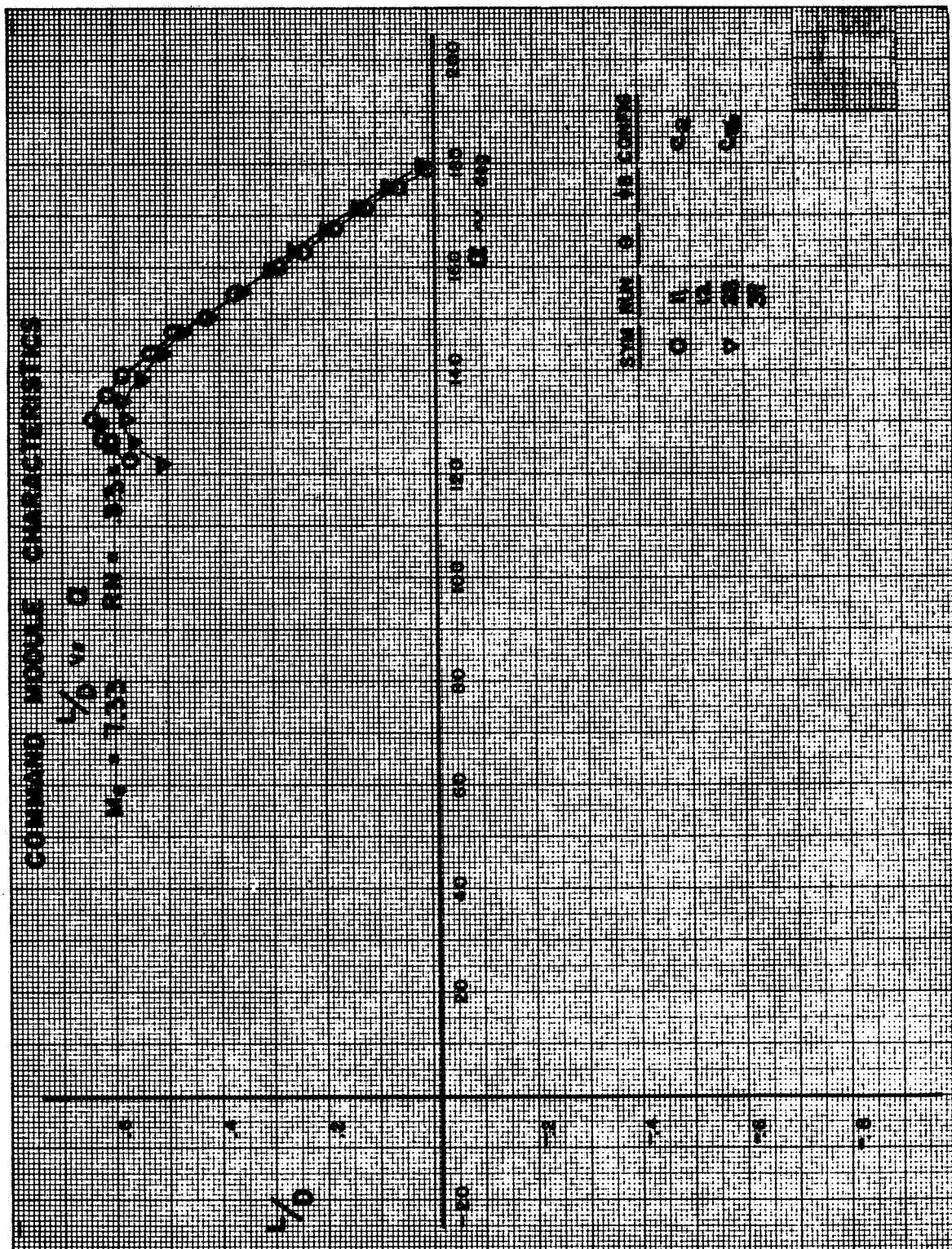
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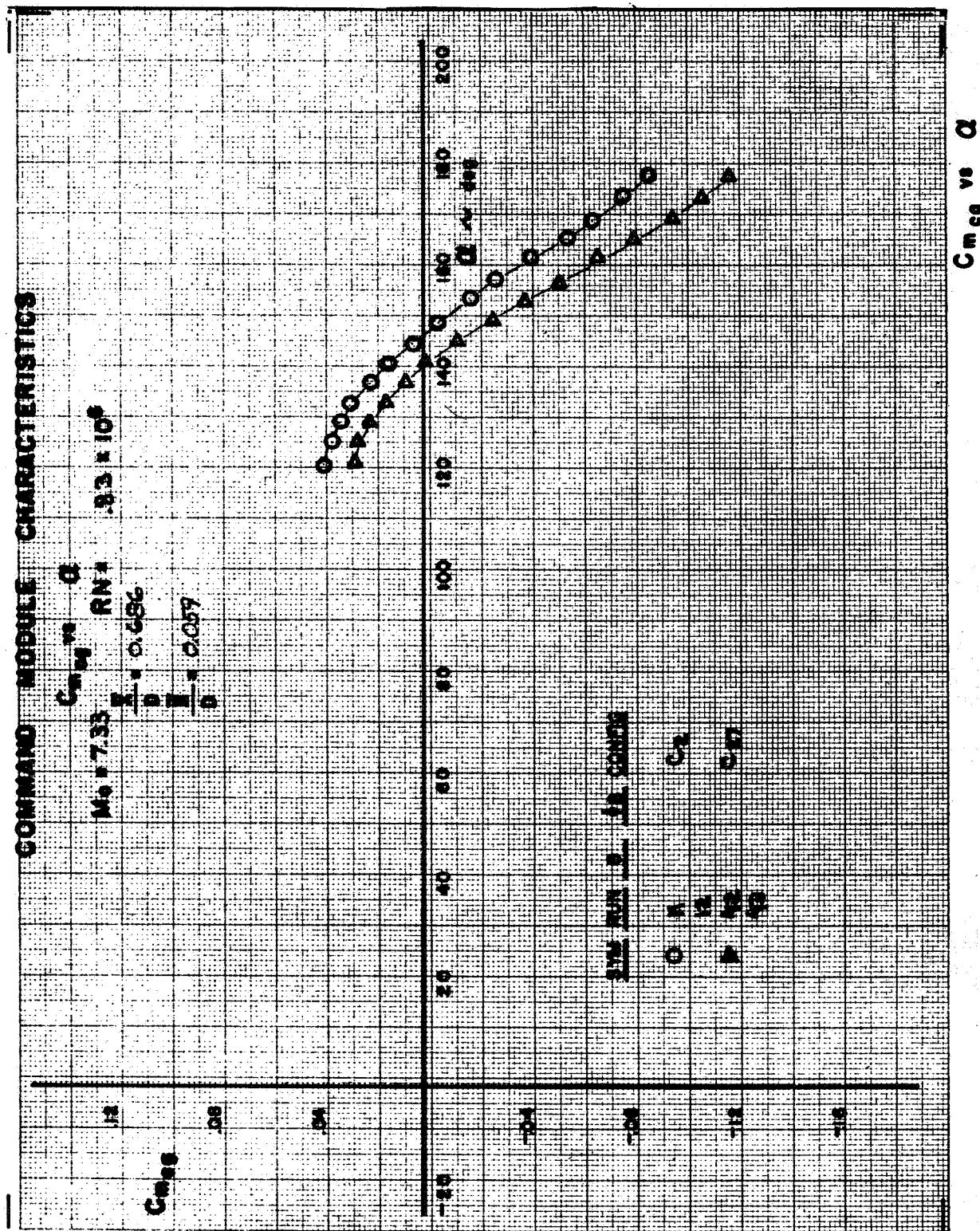
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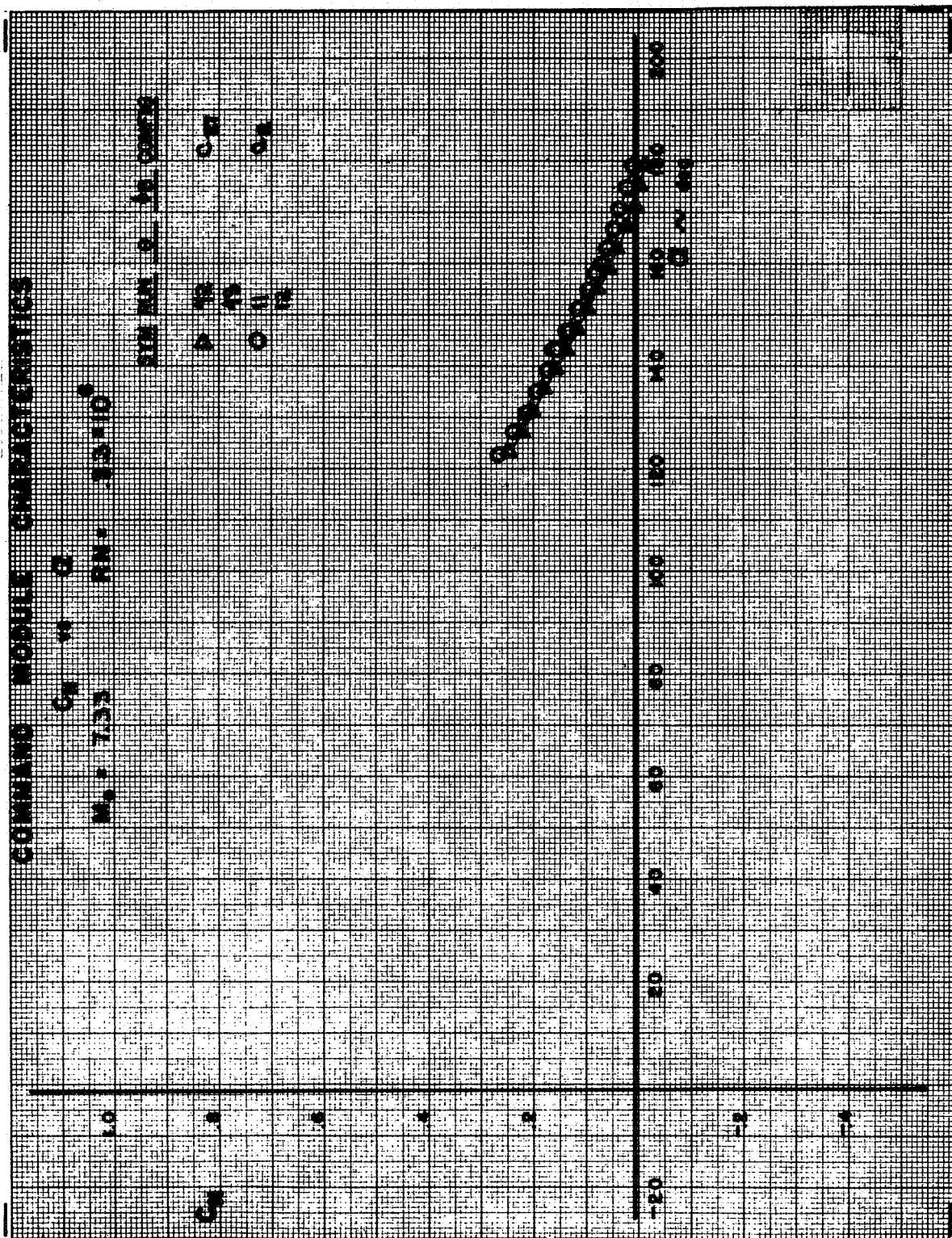


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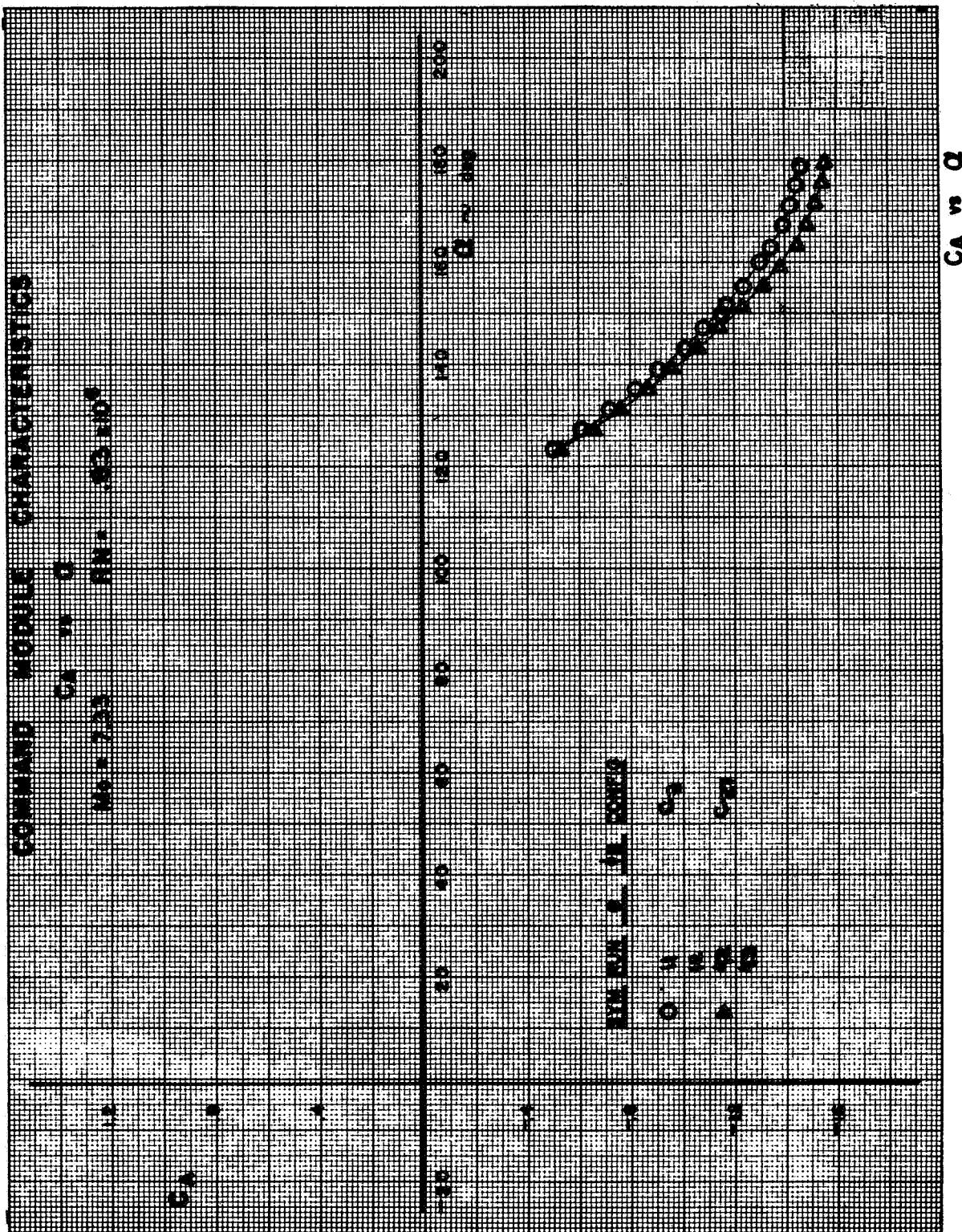


Cn vs Q

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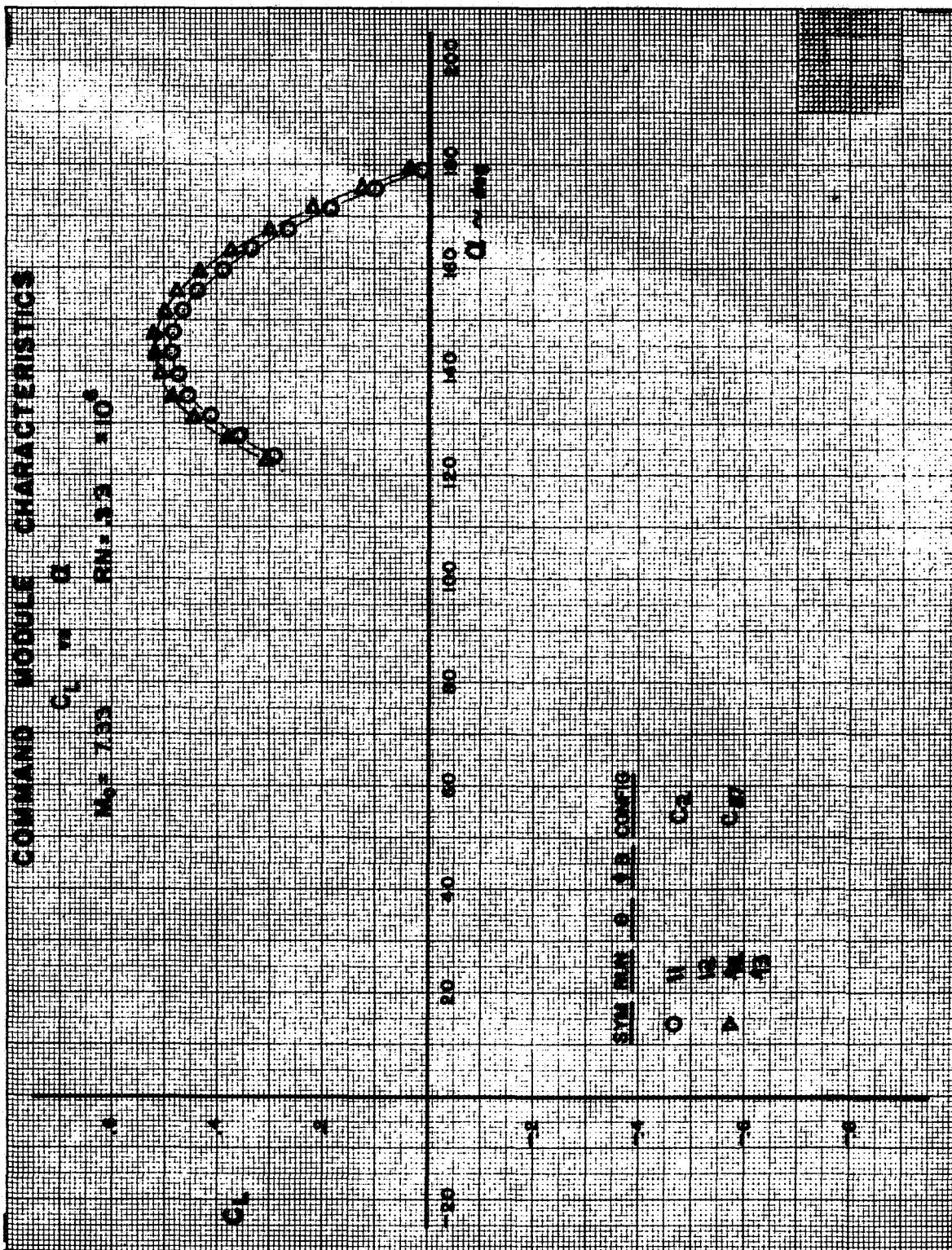


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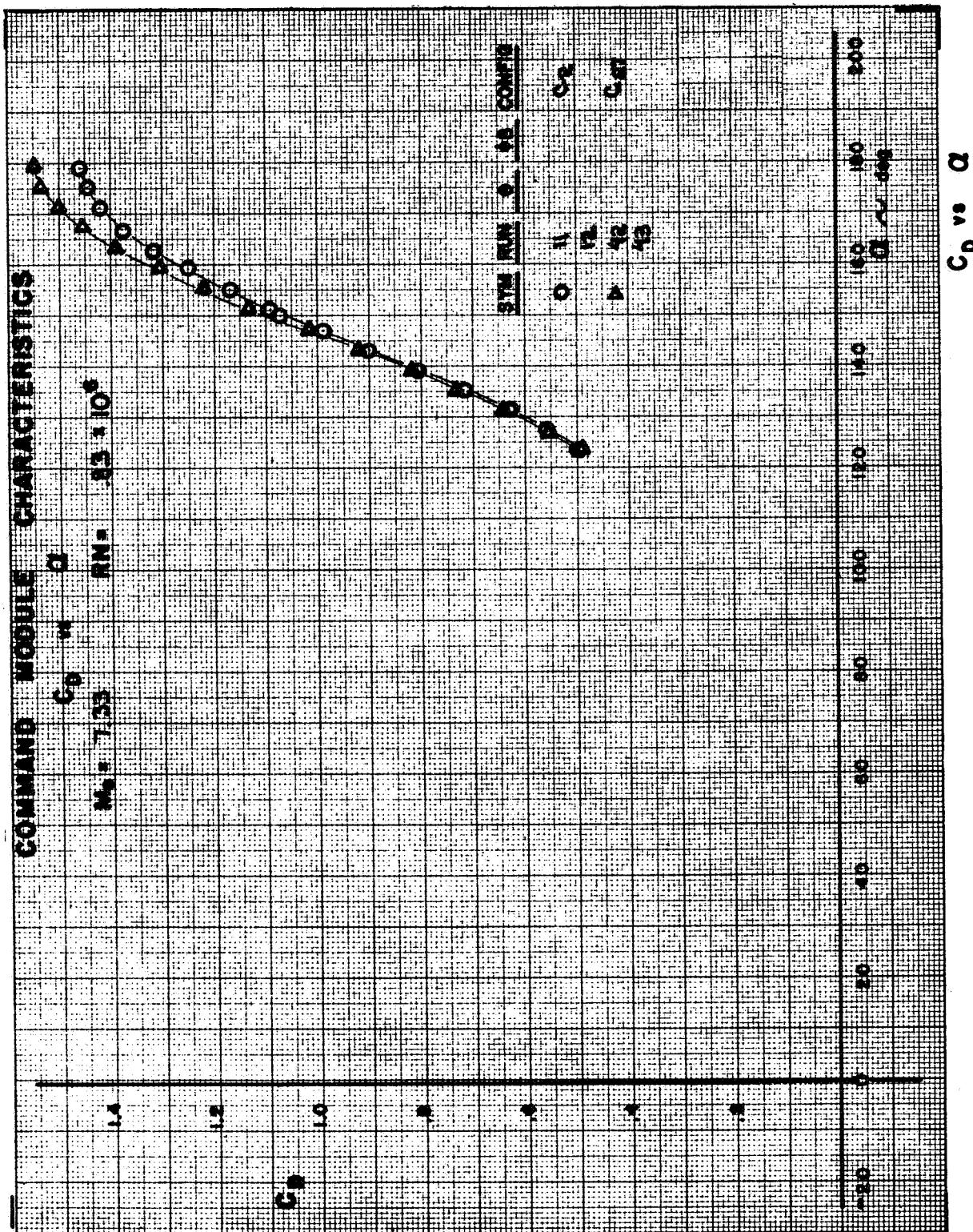
B-16

SID 62-1256

CL vs  $\alpha$

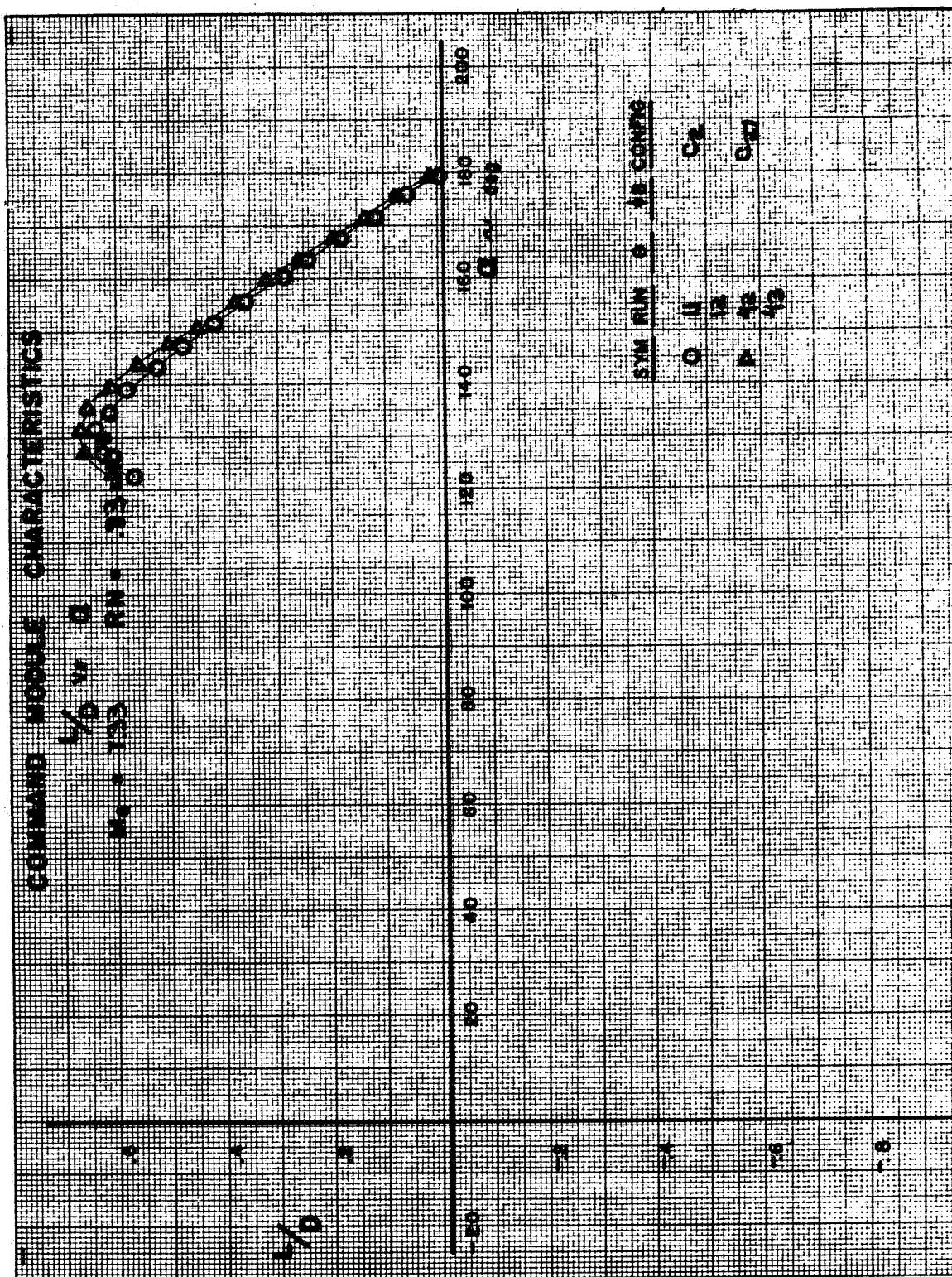


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B-18

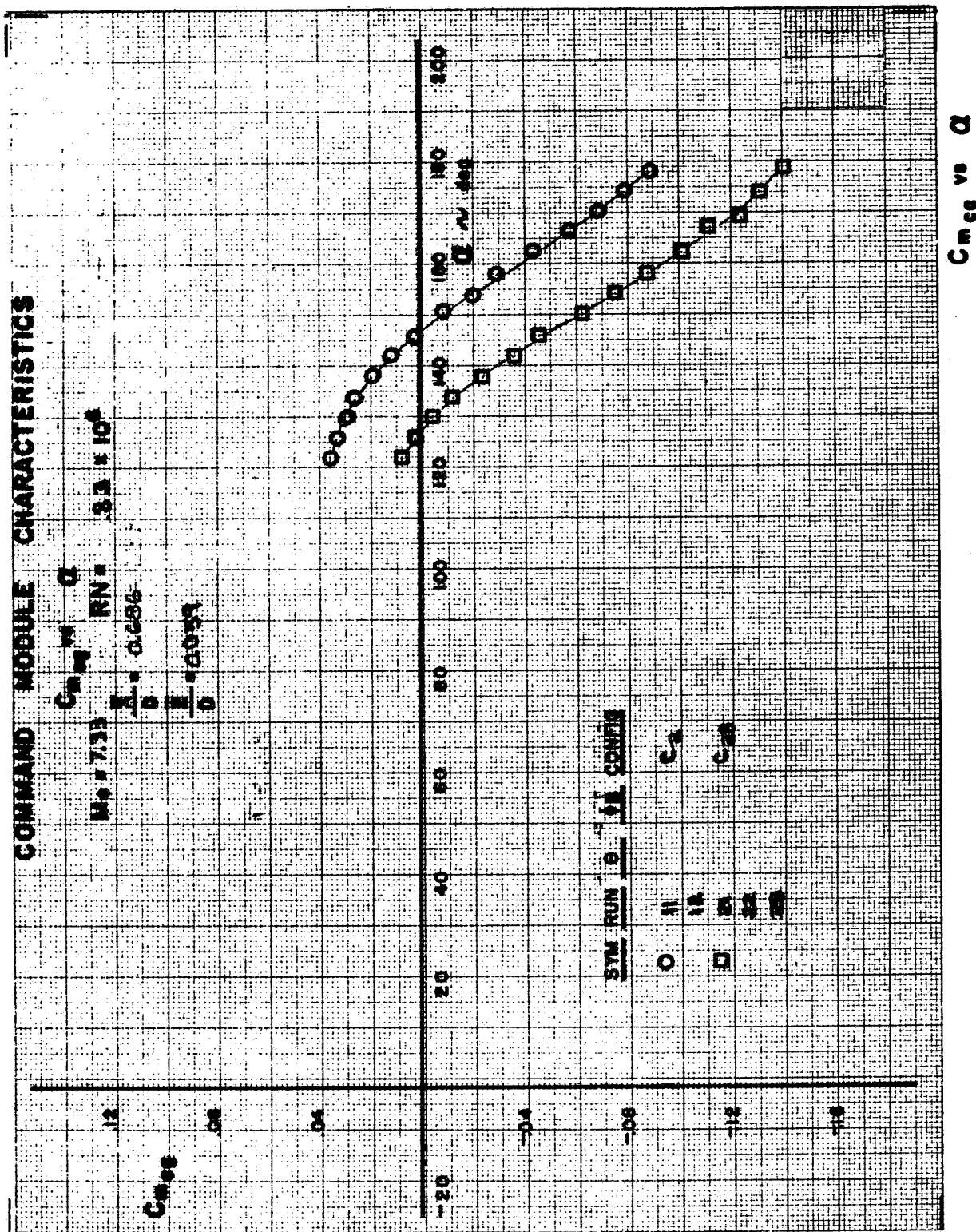
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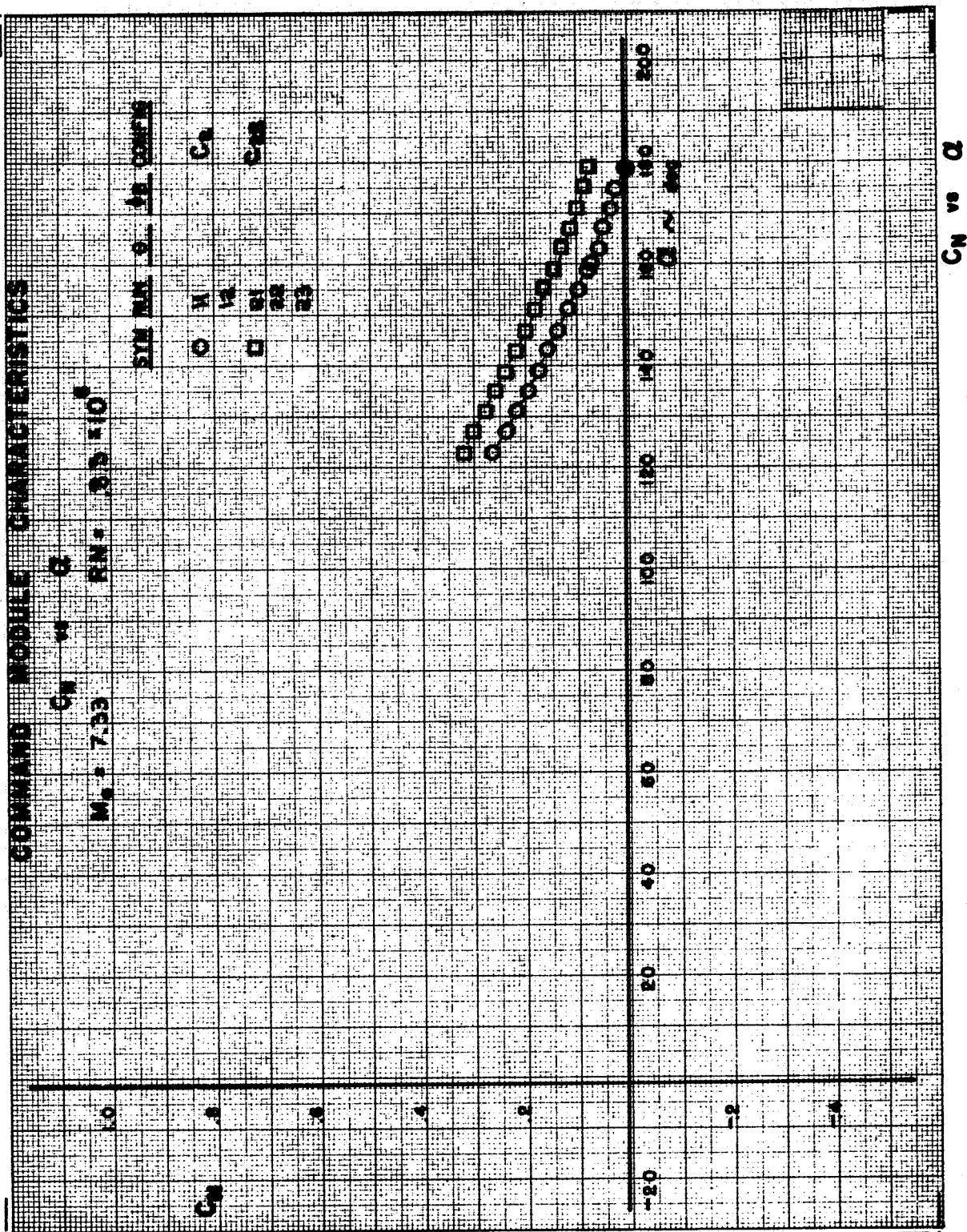
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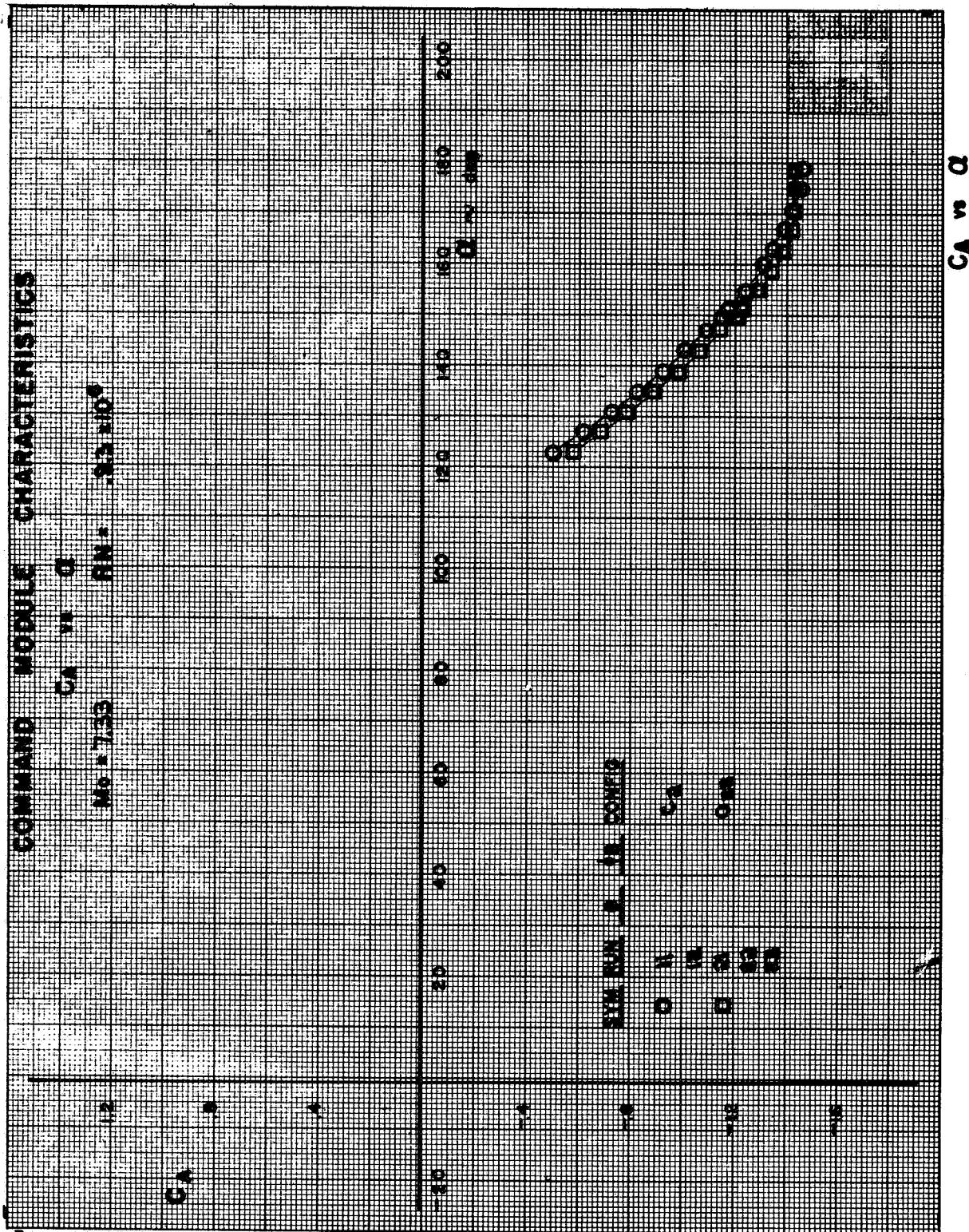


B-21

SID 62-1256



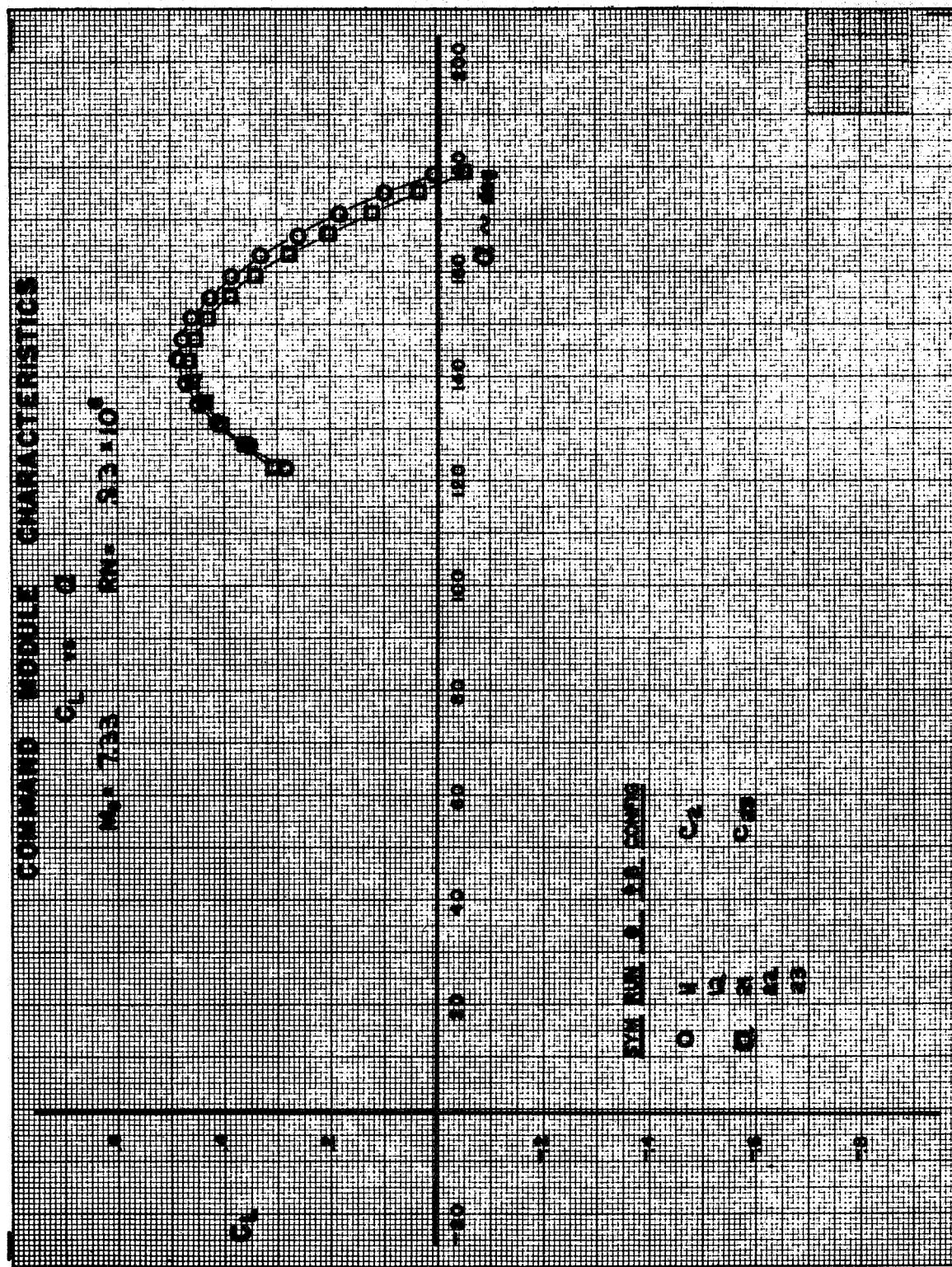
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B-22

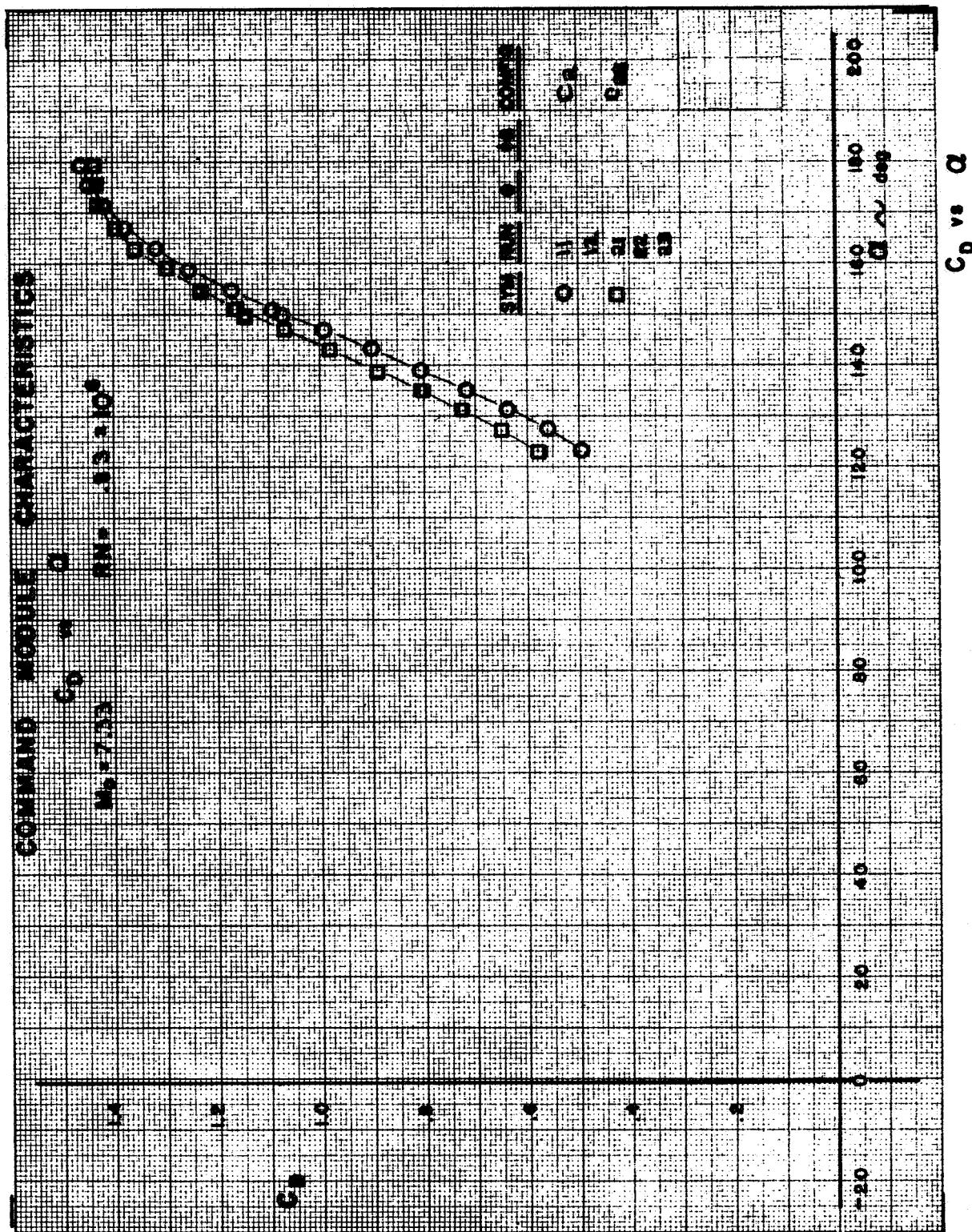
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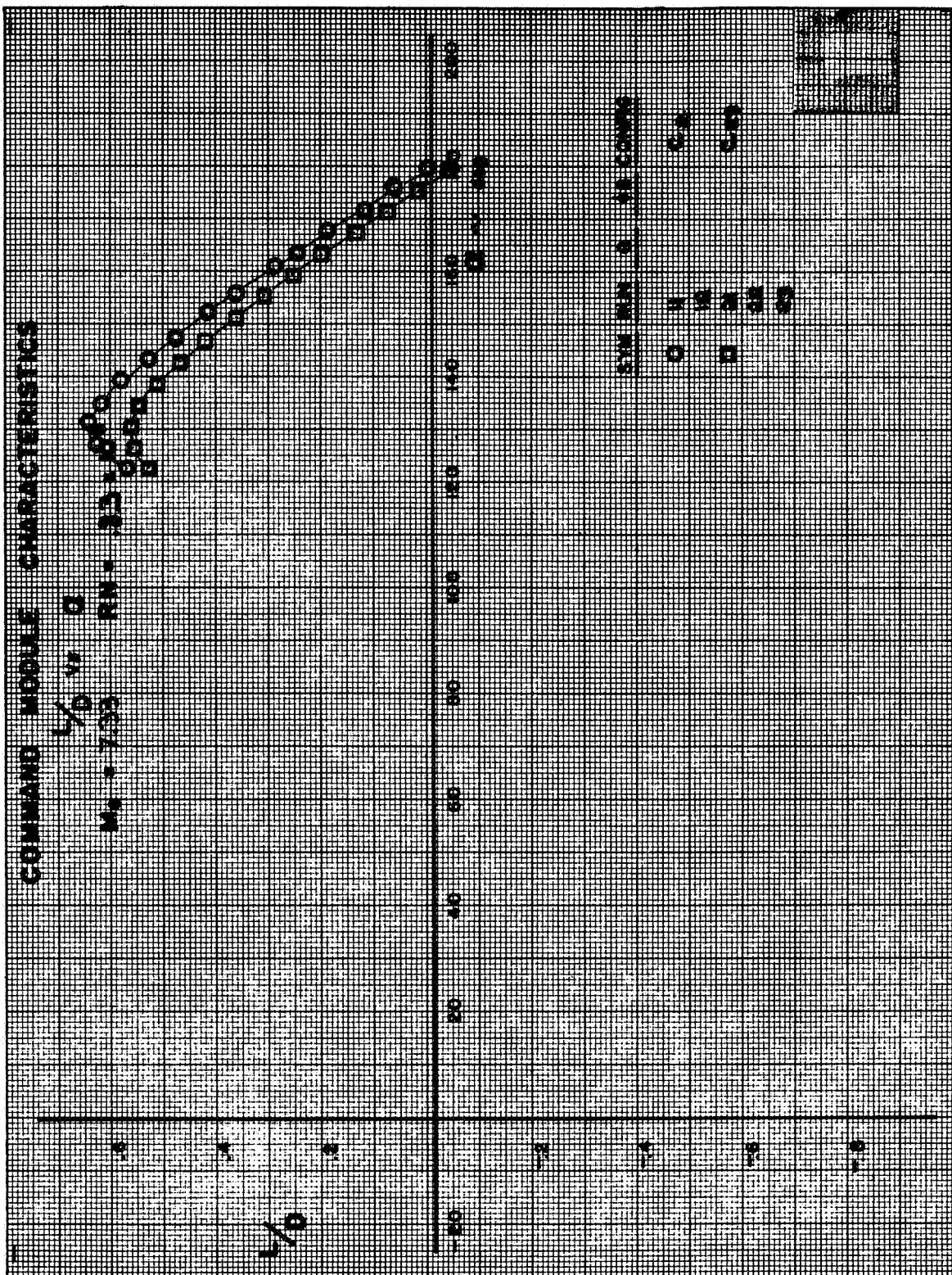
B-24

SID 62-1256

NORTH AMERICAN AVIATION, INC.



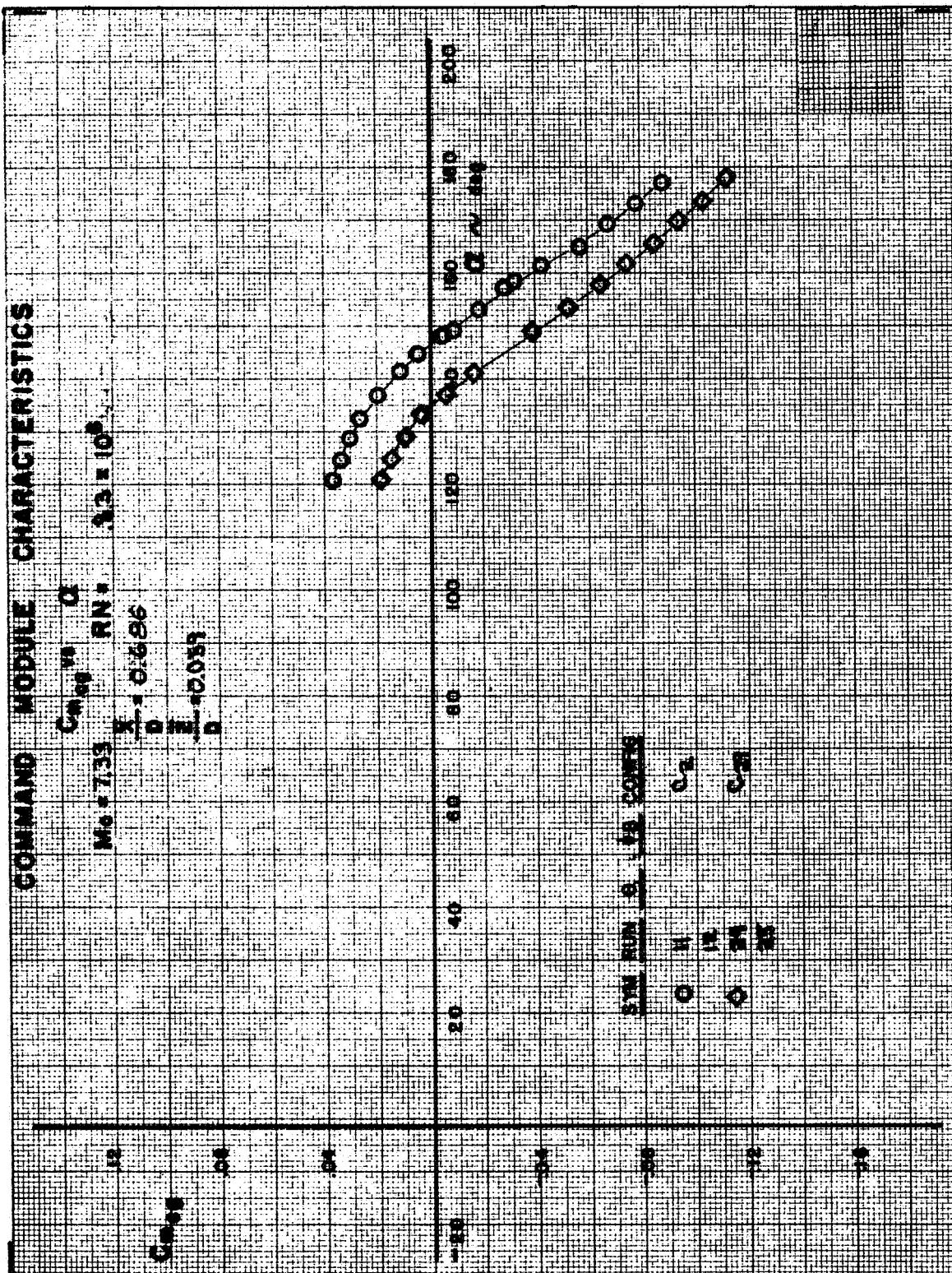
## **SPACE and INFORMATION SYSTEMS DIVISION**

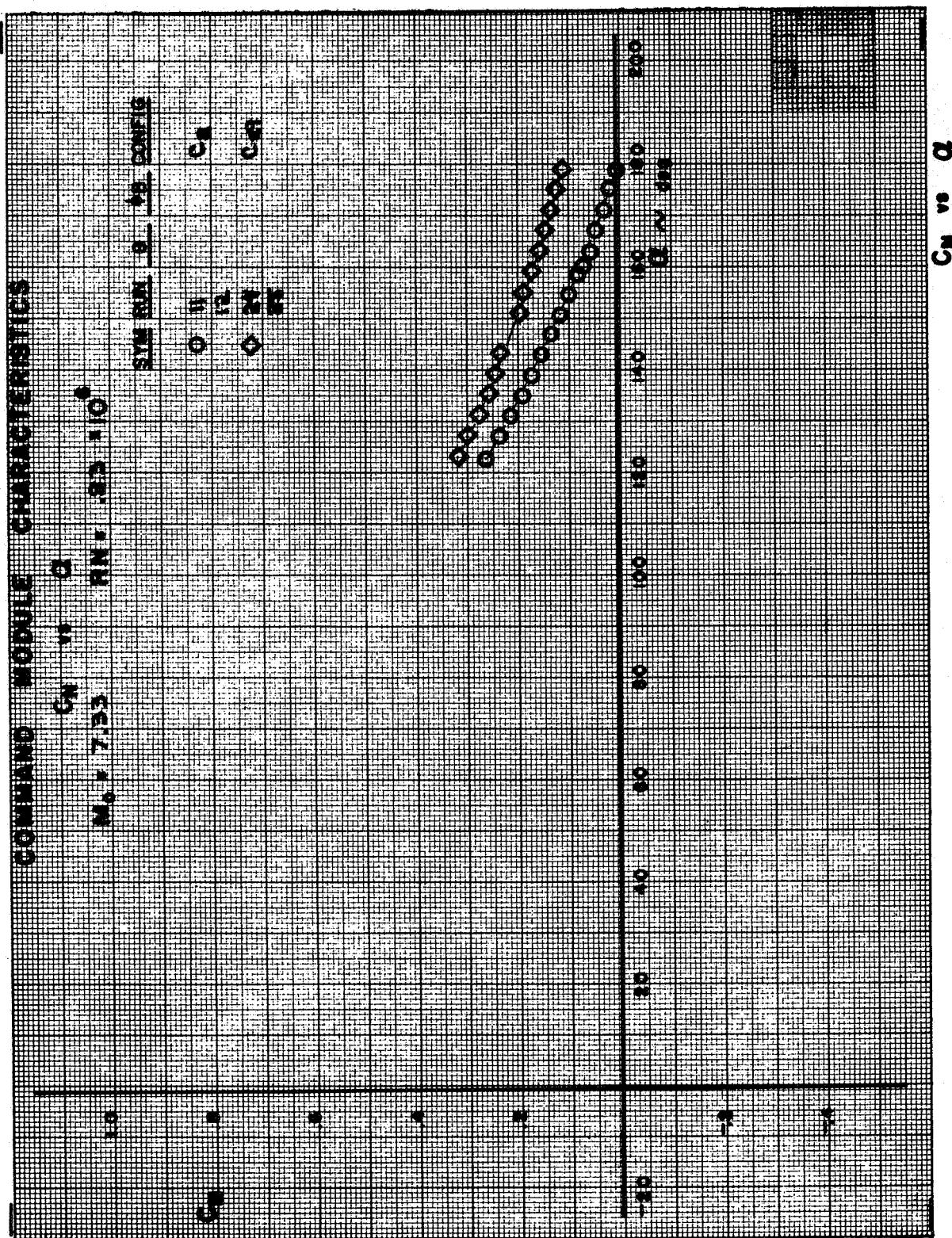


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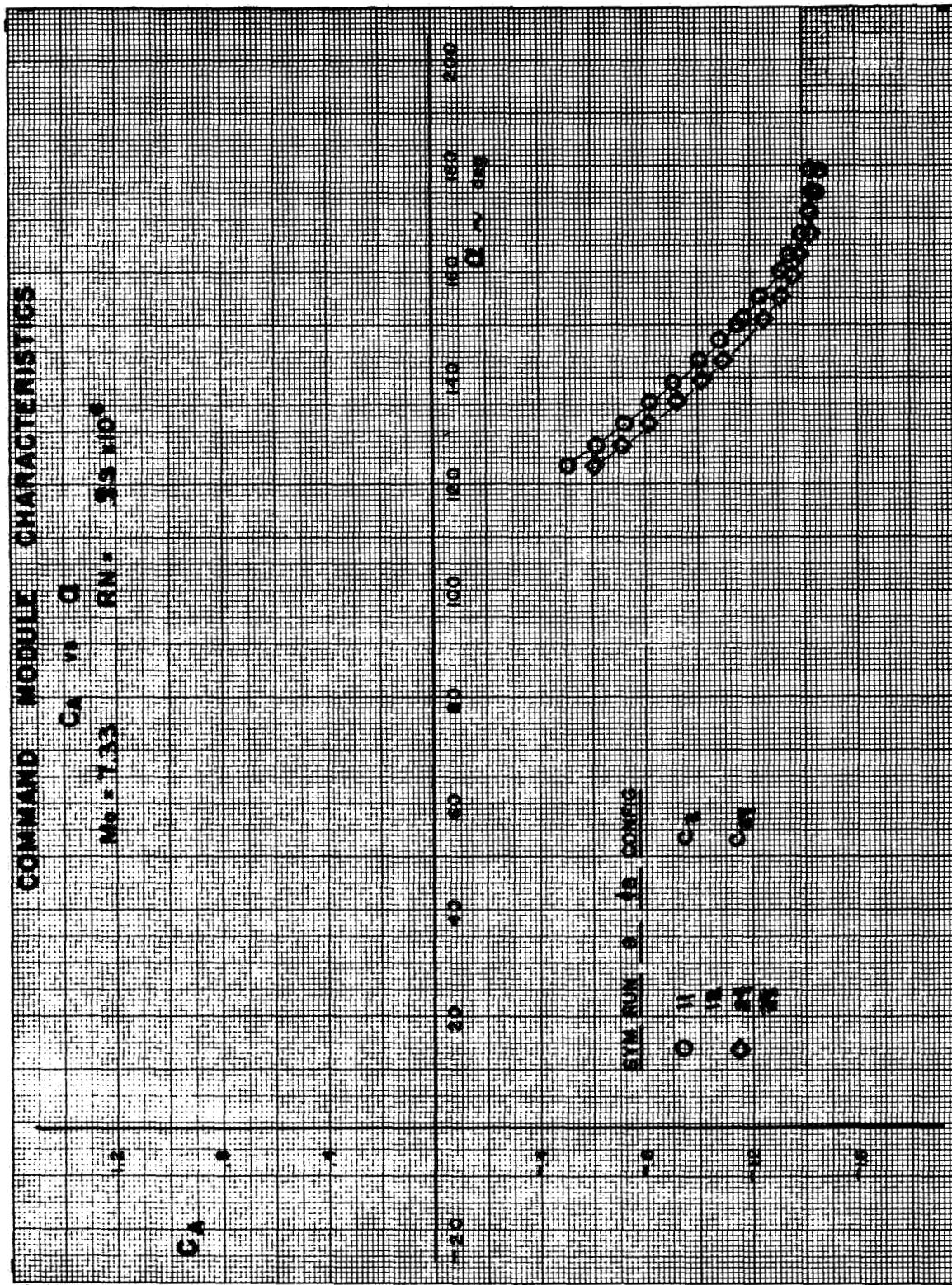
SID 62-1256

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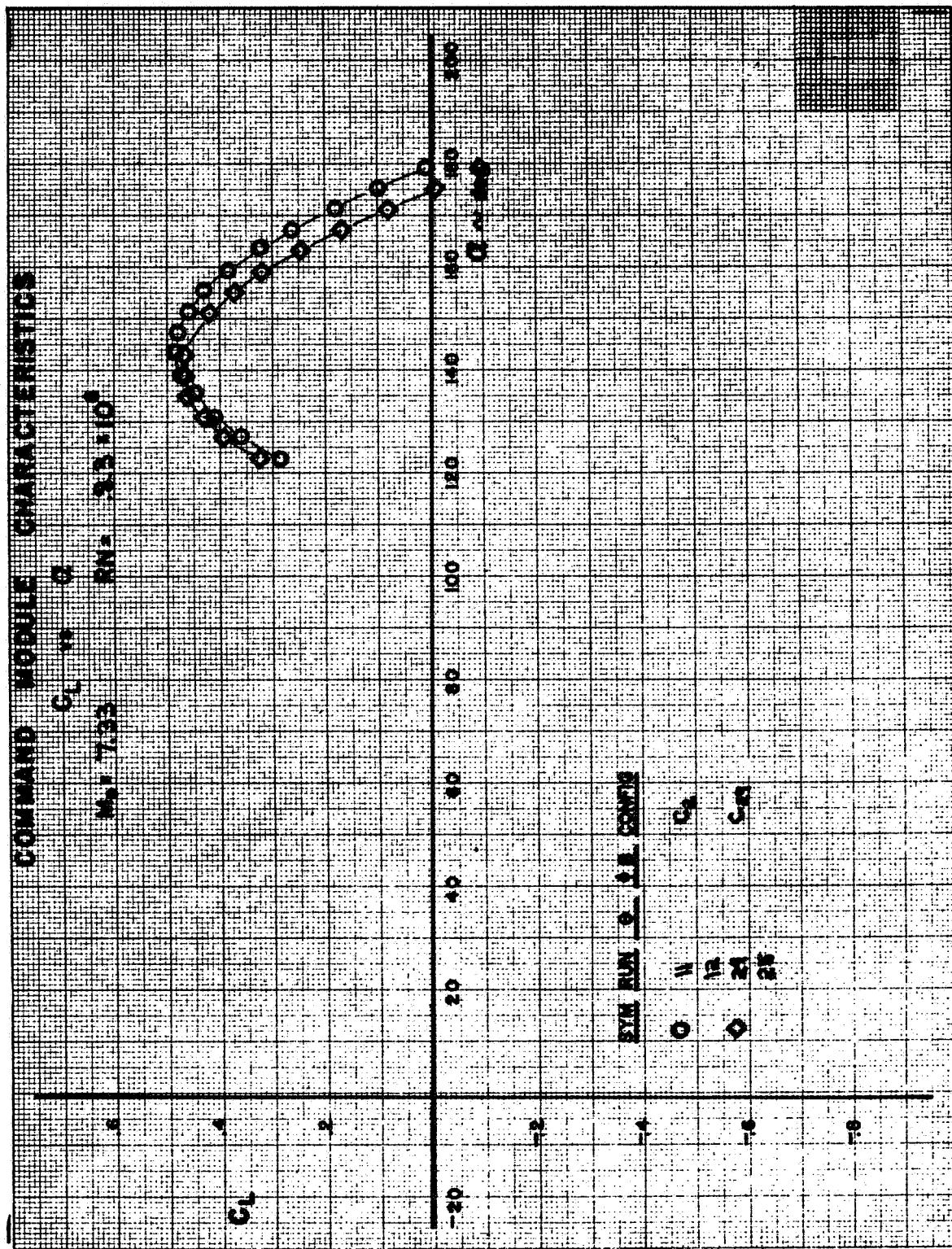
SOMMELIER'S GUIDE TO THE FINE WINES OF CALIFORNIA

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SID 62-1256

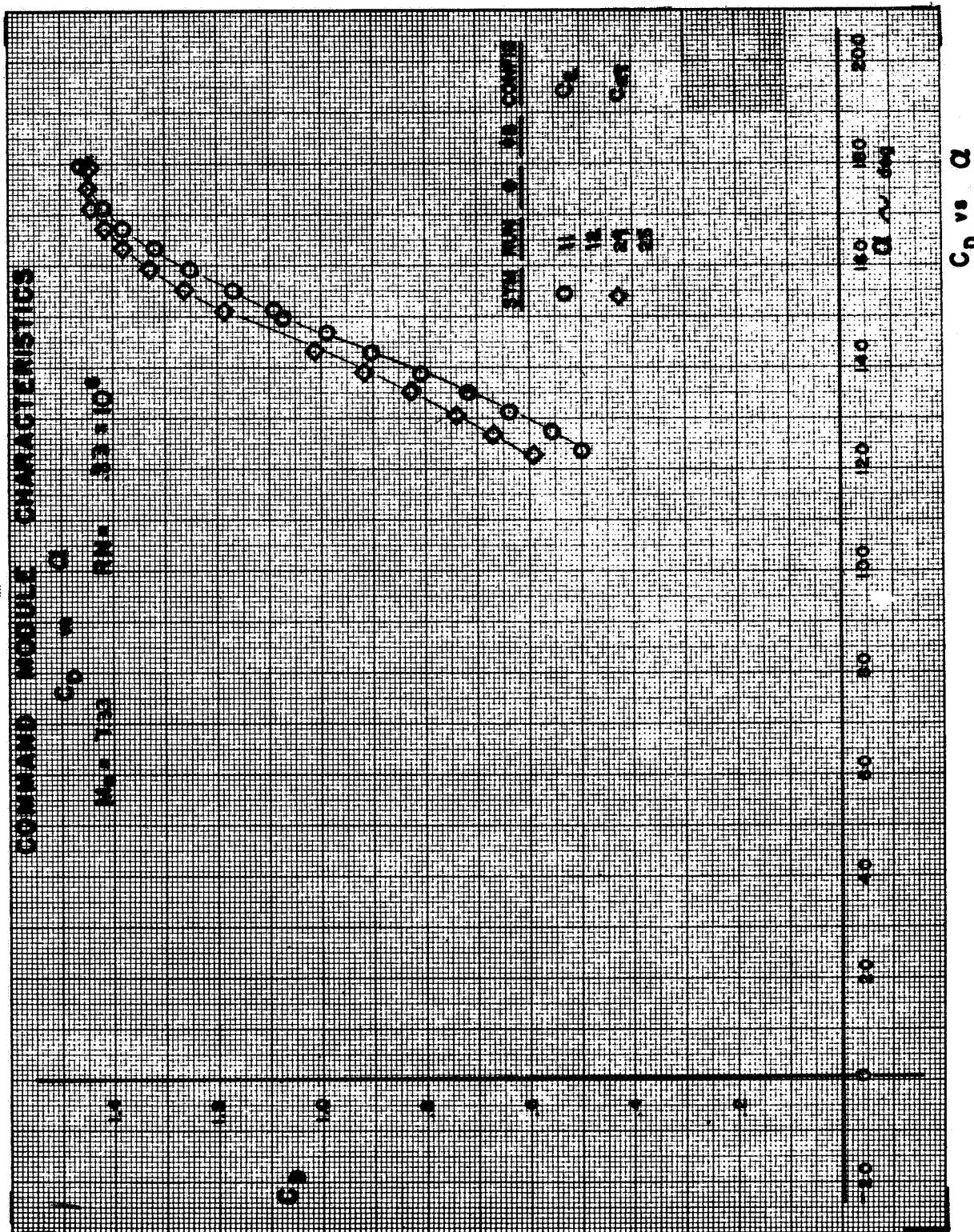


B-29

SID 62-1256



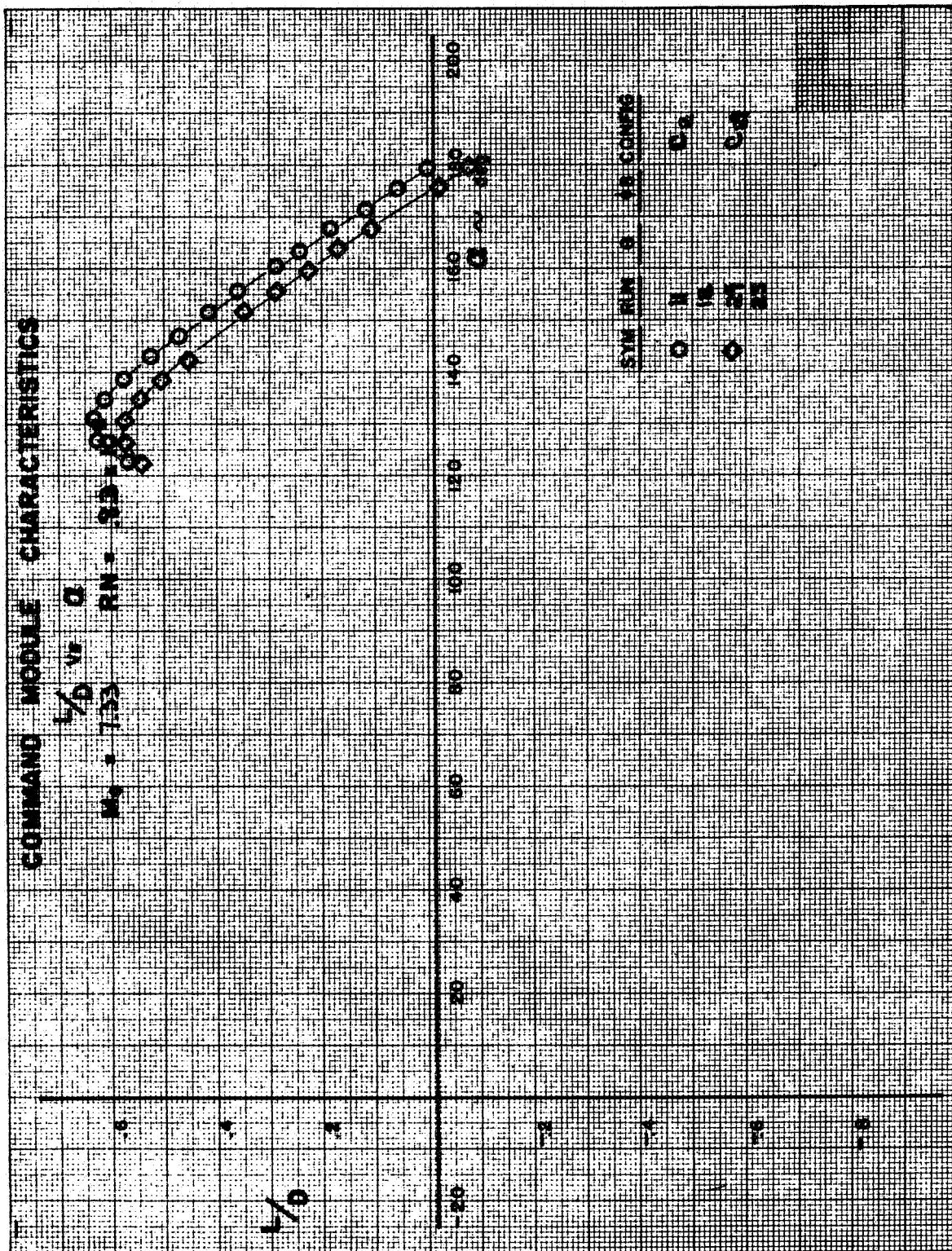
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B-30

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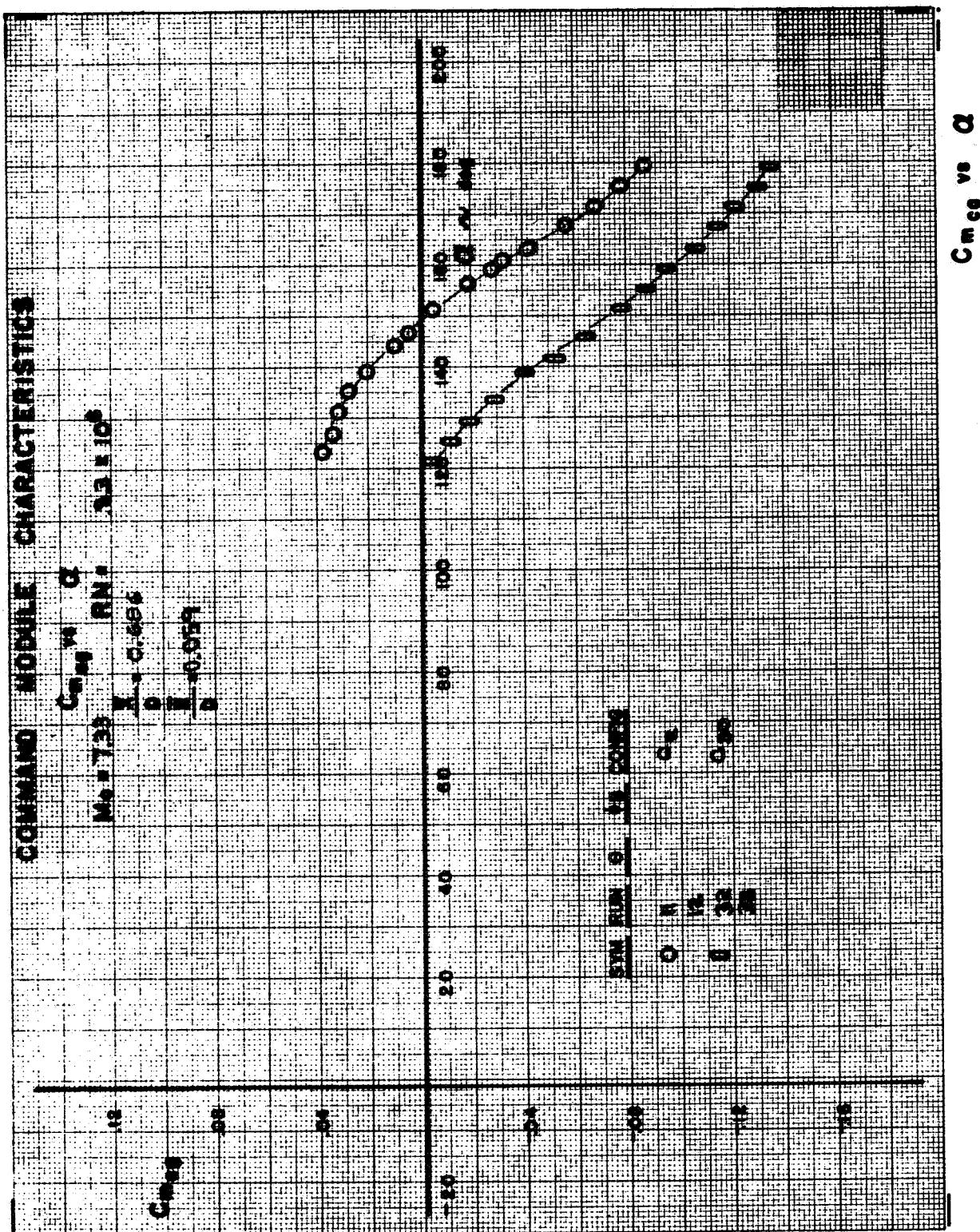
SID 62-1256



L/D =  $\alpha$

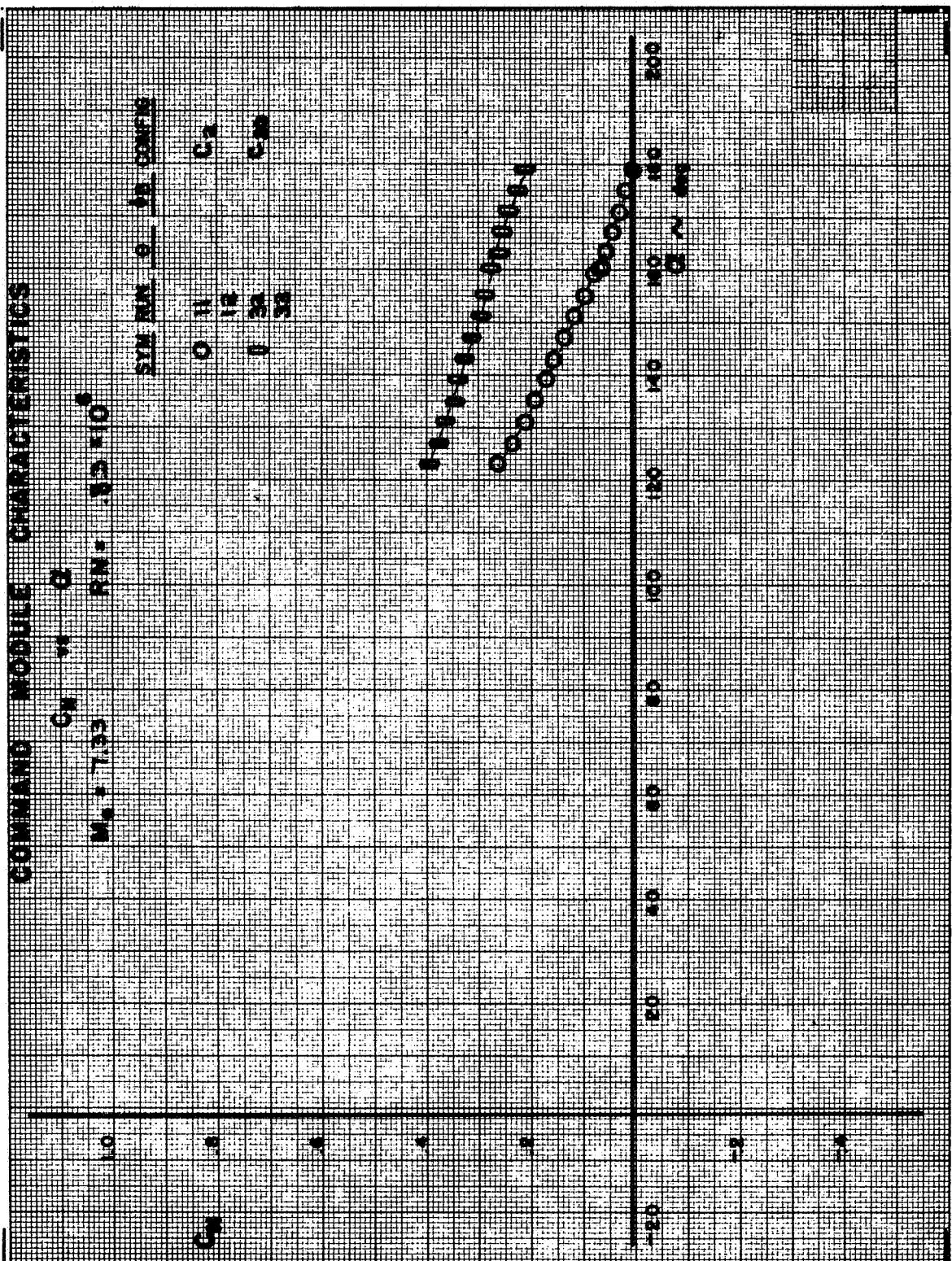


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SID 62-1256



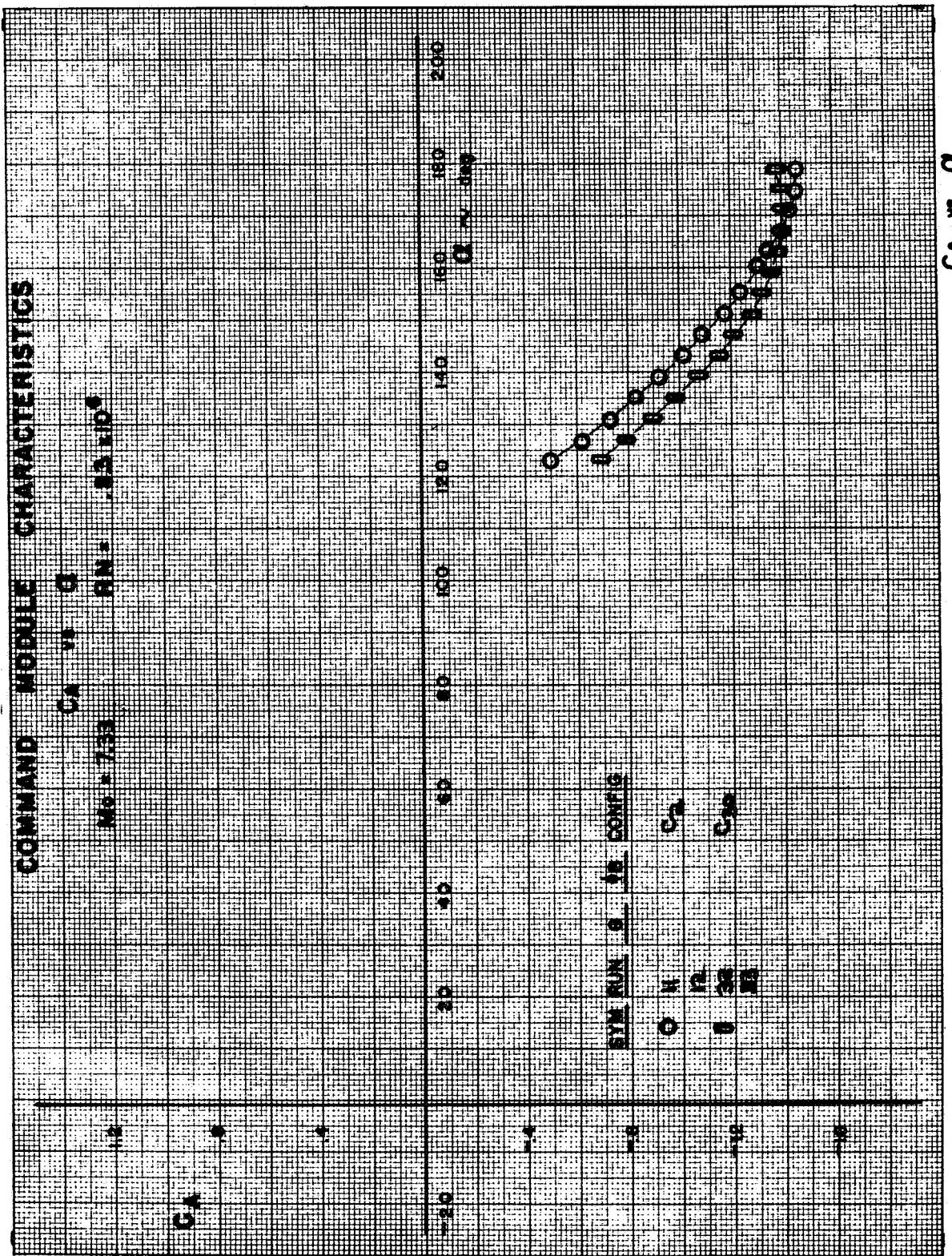
CH = Q

SOLAR SYSTEM PLANETARY POSITION CHART

Mars - 7.33 \* 10<sup>-10</sup> AU<sup>2</sup>/sec<sup>2</sup> Sun-Earth = 1.35 \* 10<sup>-10</sup> AU<sup>2</sup>/sec<sup>2</sup>

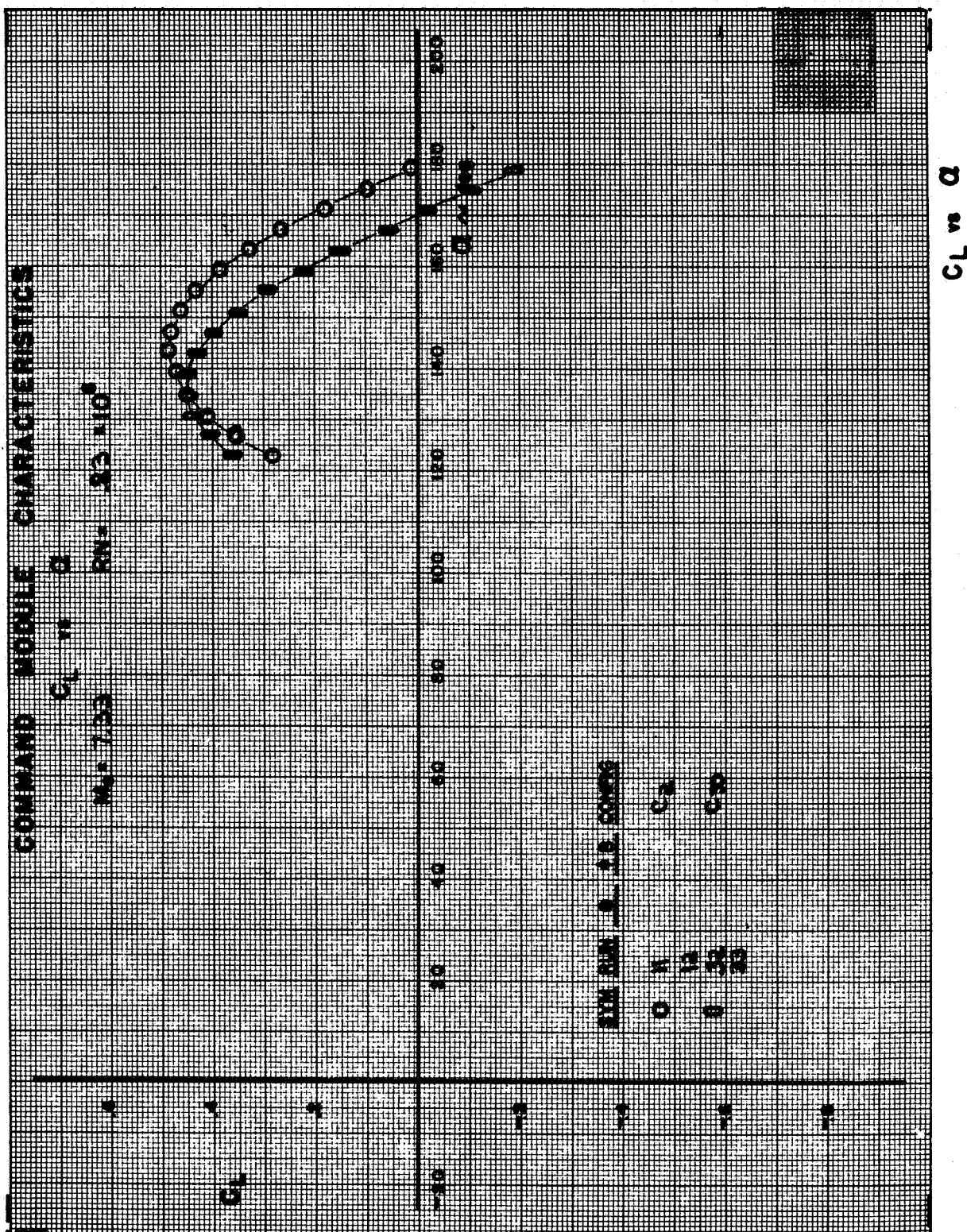


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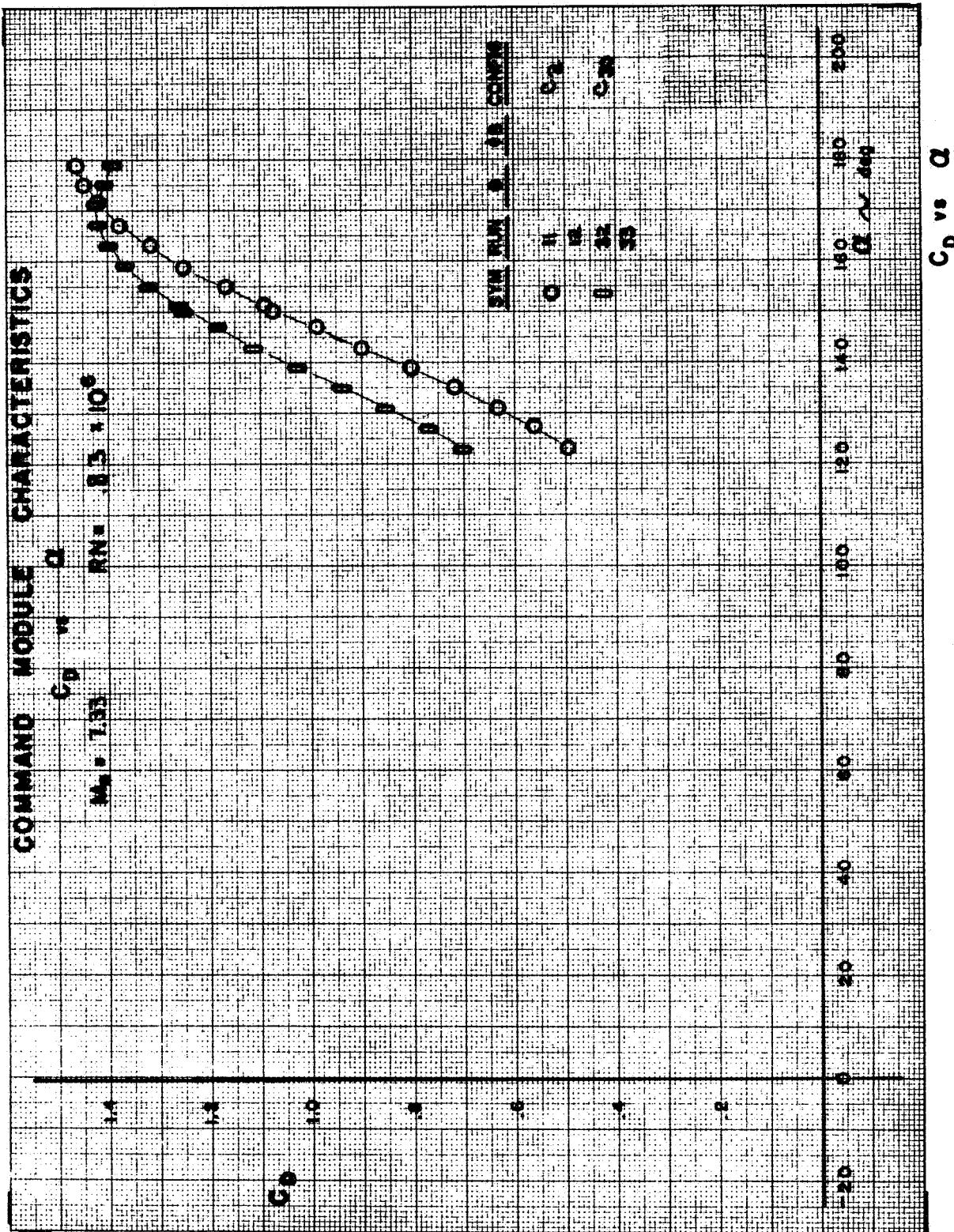
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SID 62-1256



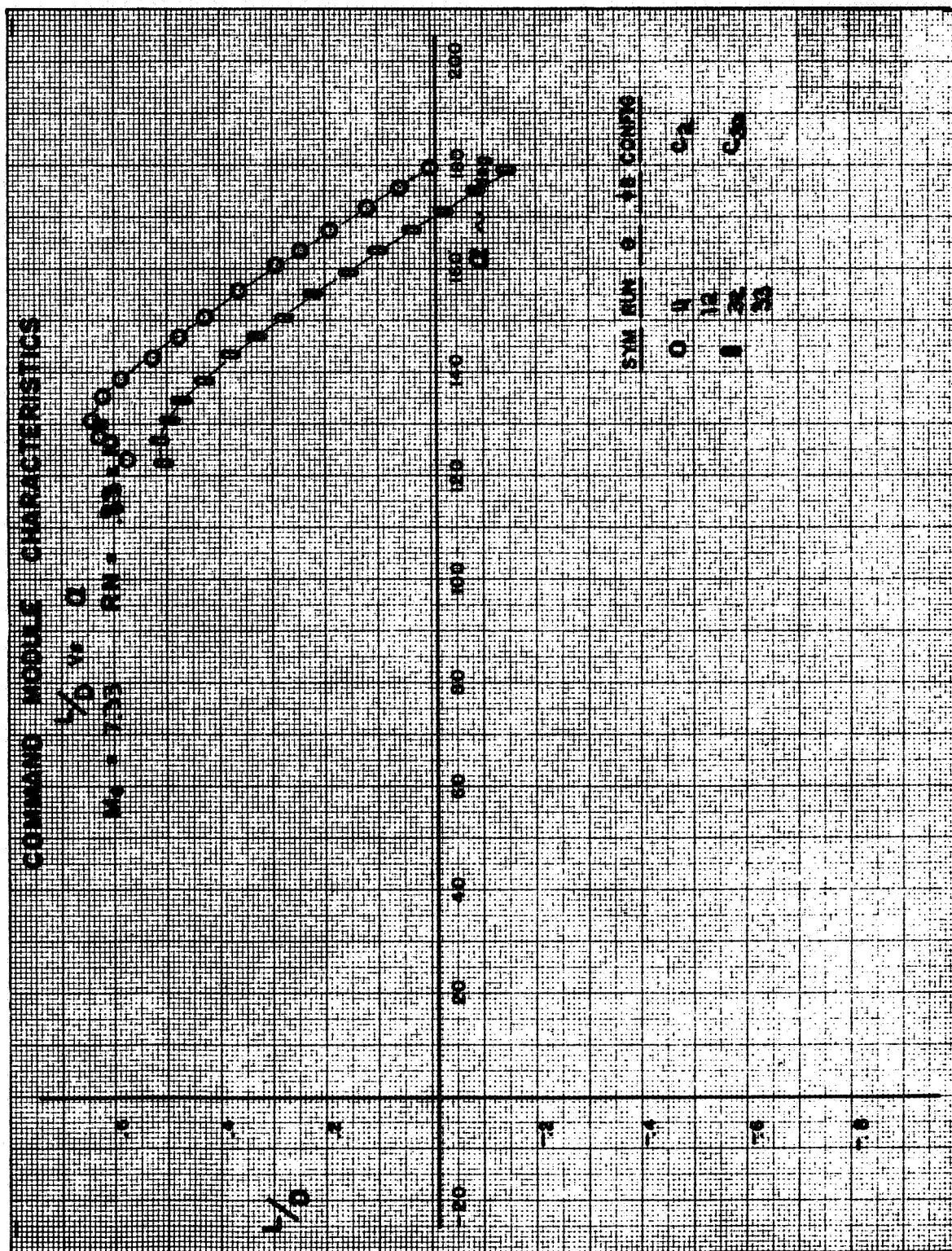


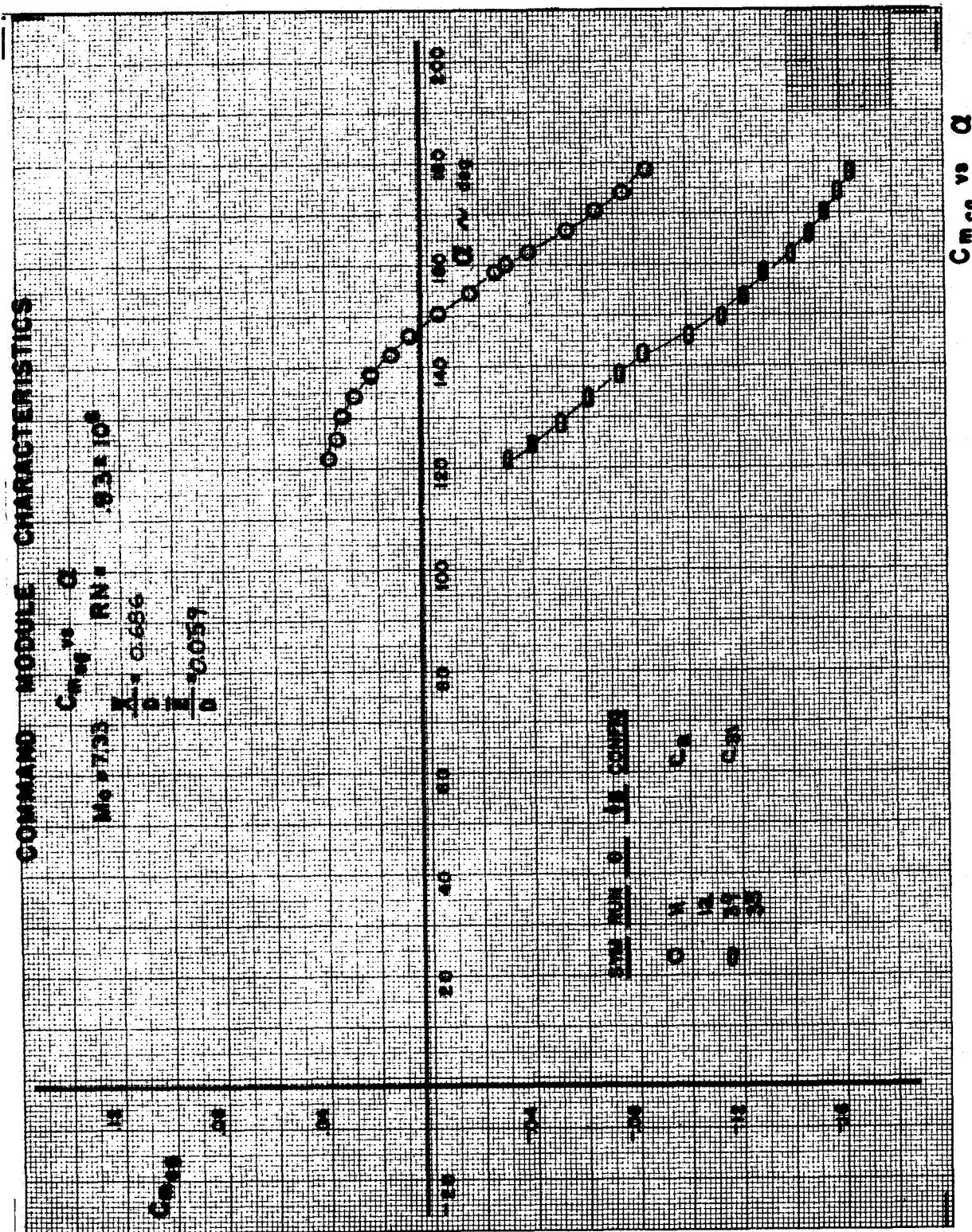
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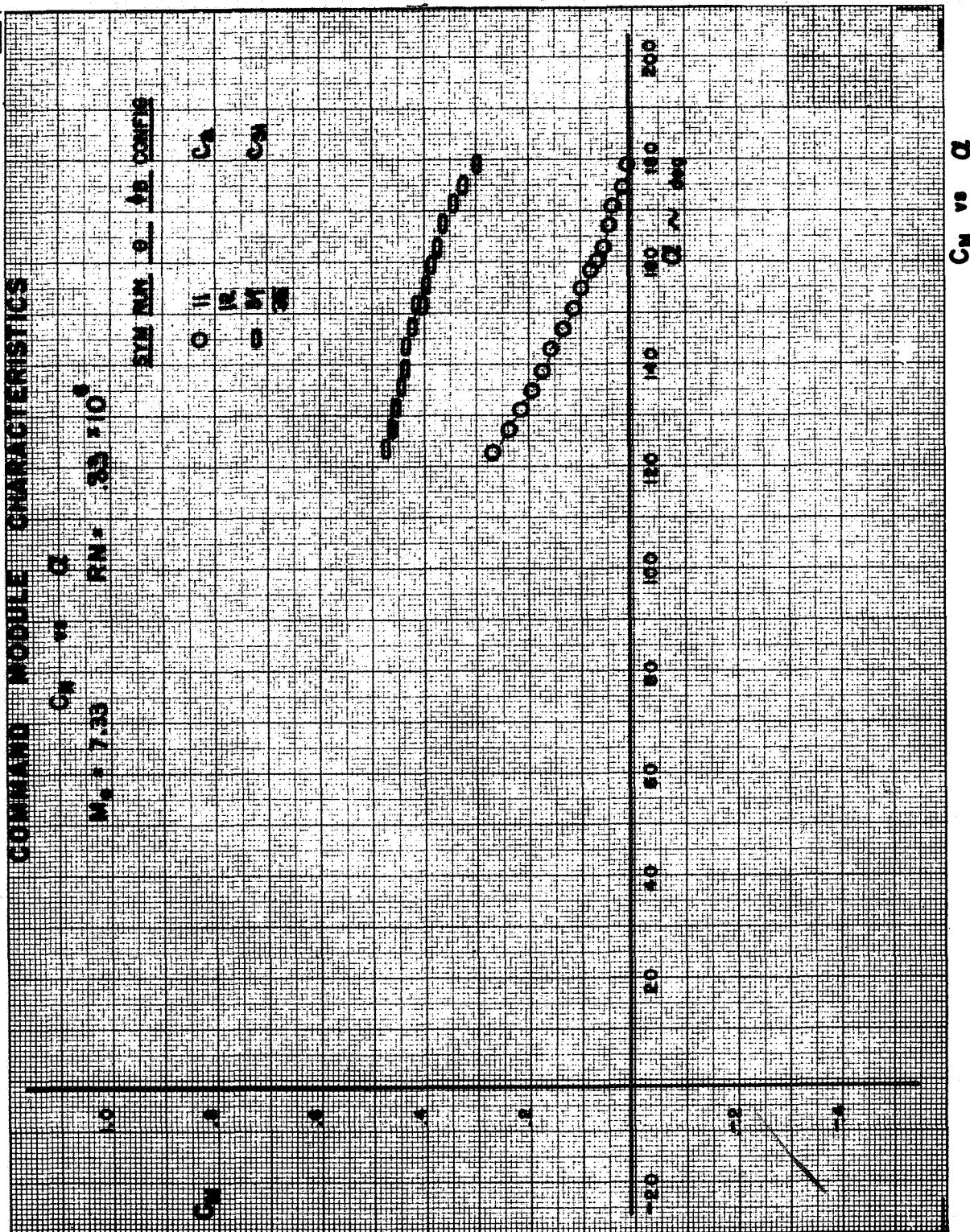
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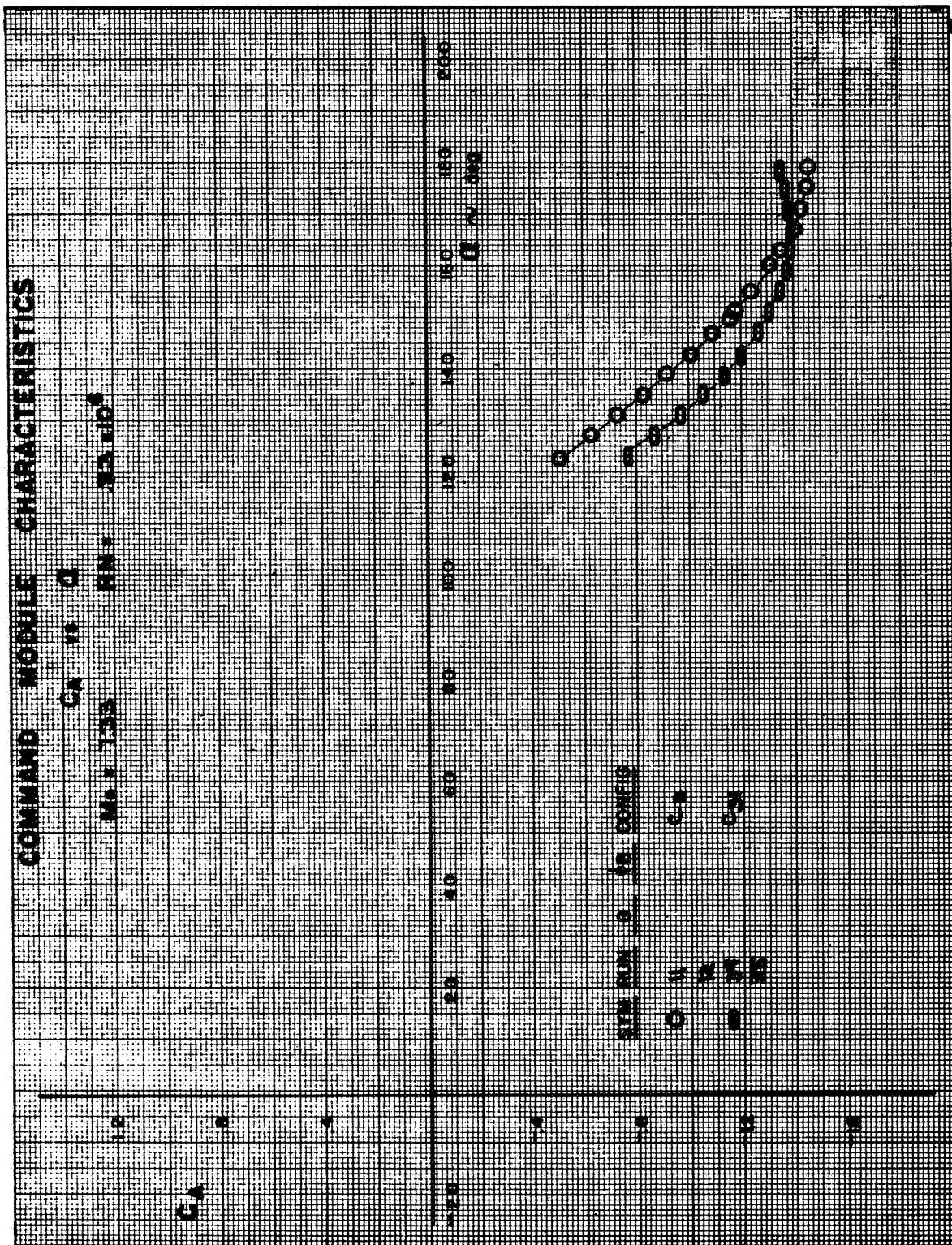
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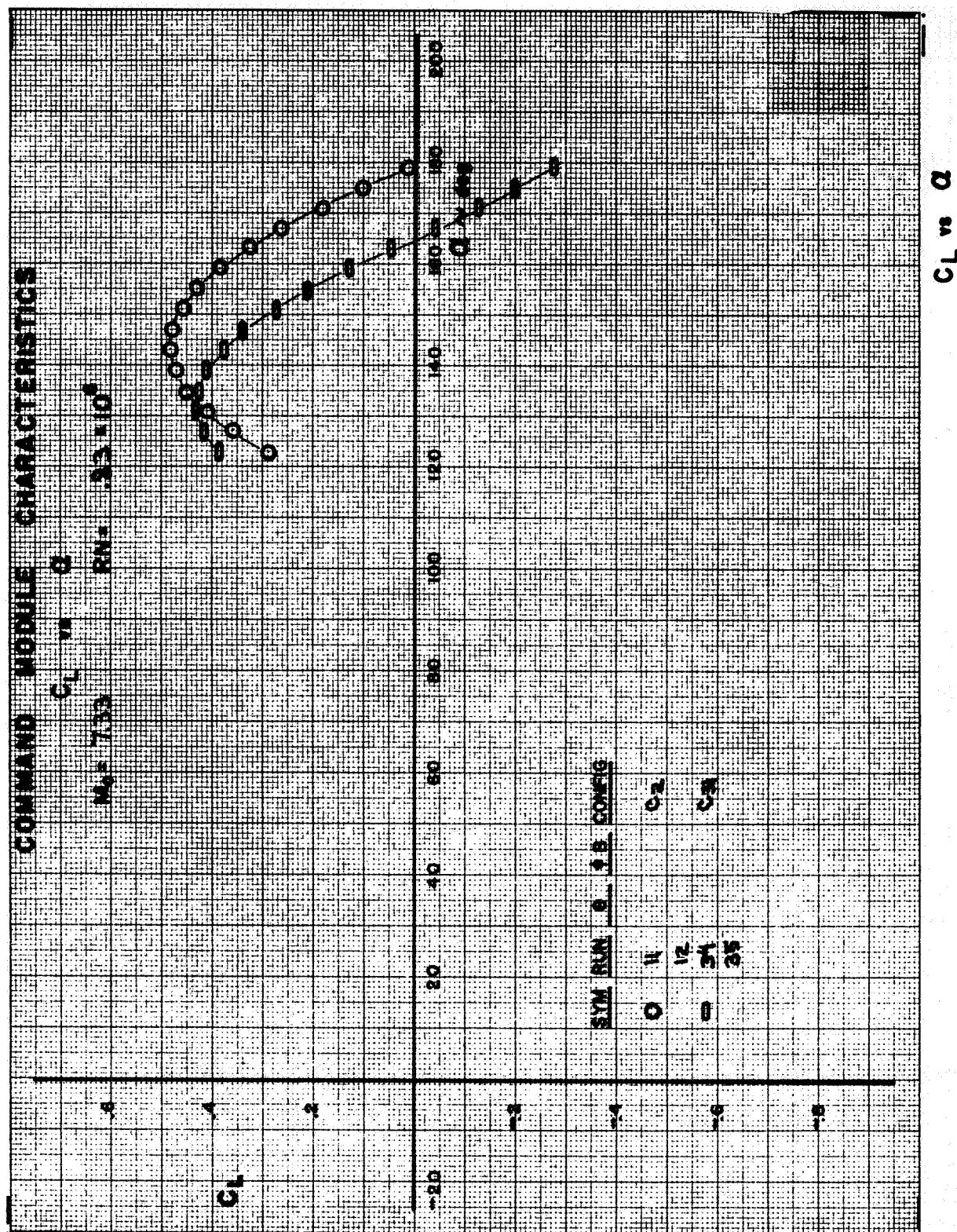
SID 62-1256



B-39

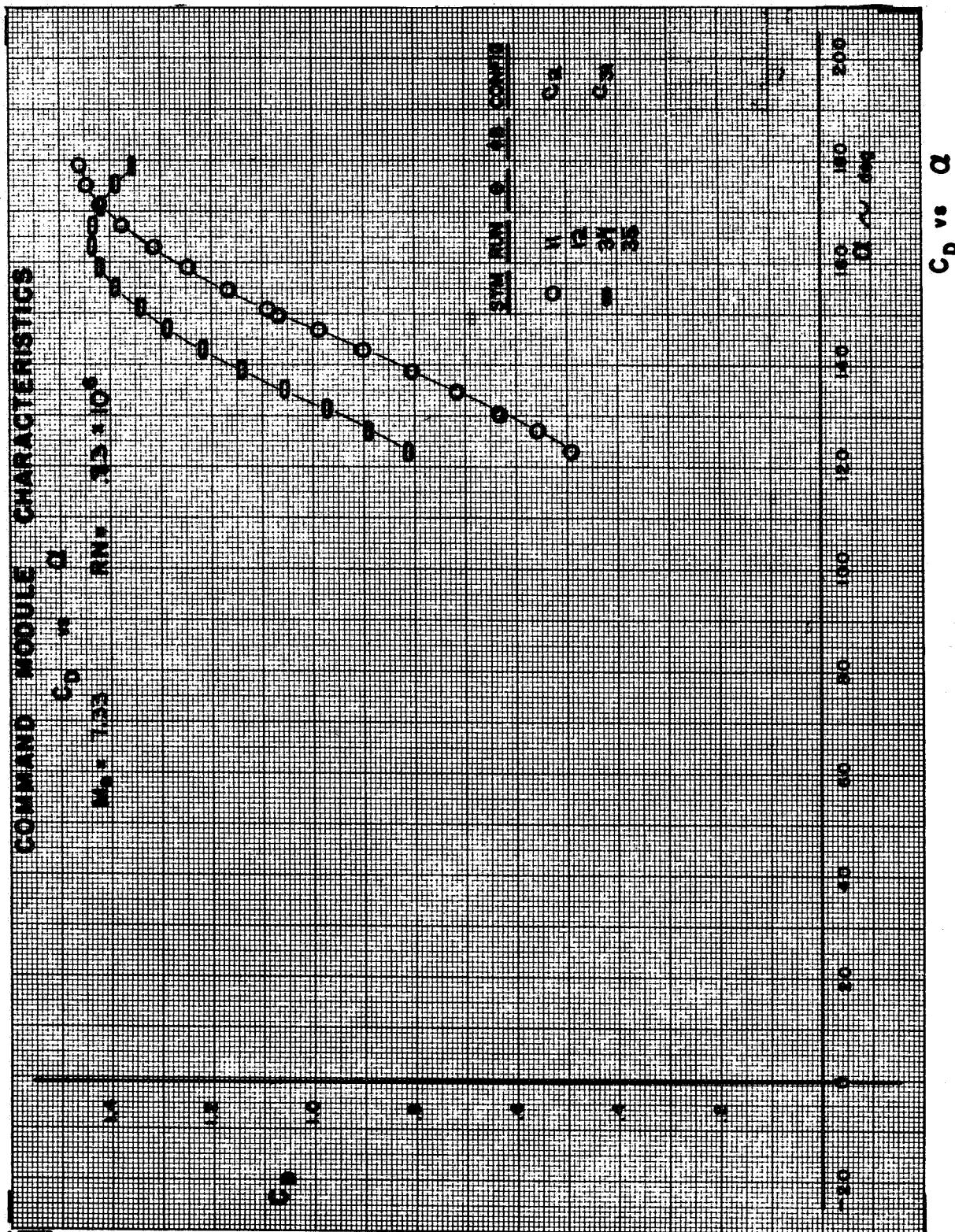
SID 62-1256

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**DEPARTMENT**

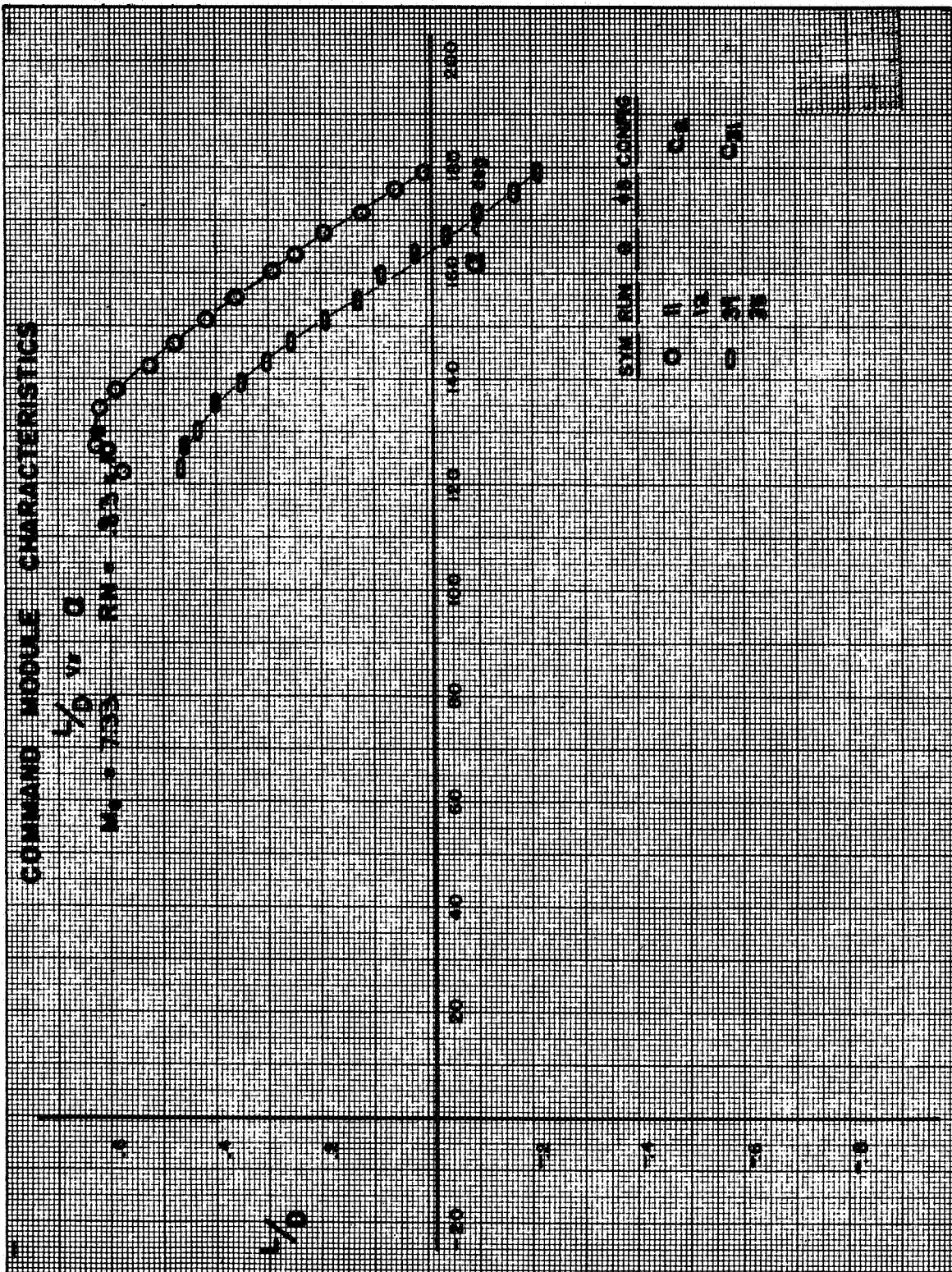


2000-01-02 10:00:00

B-42

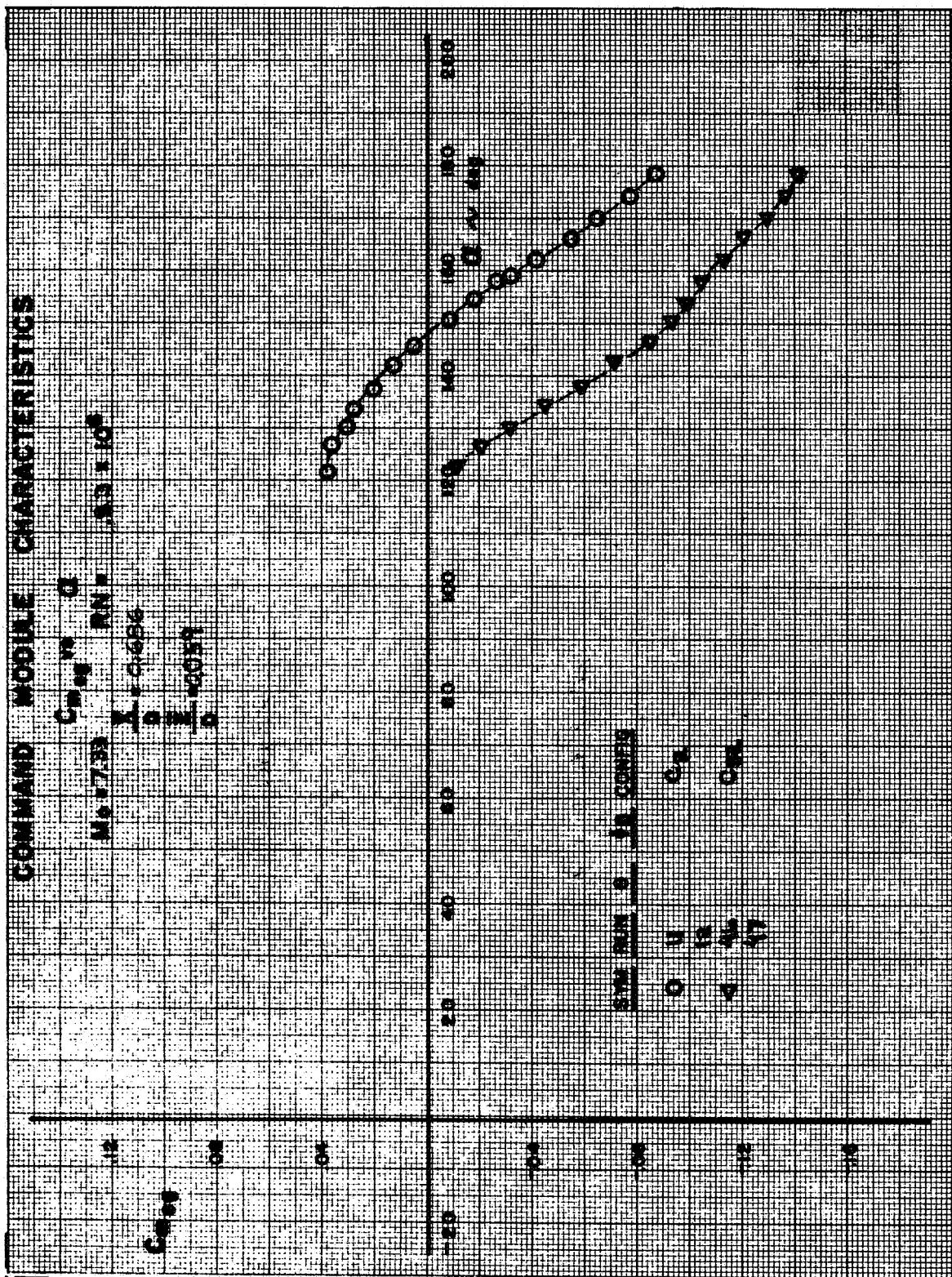
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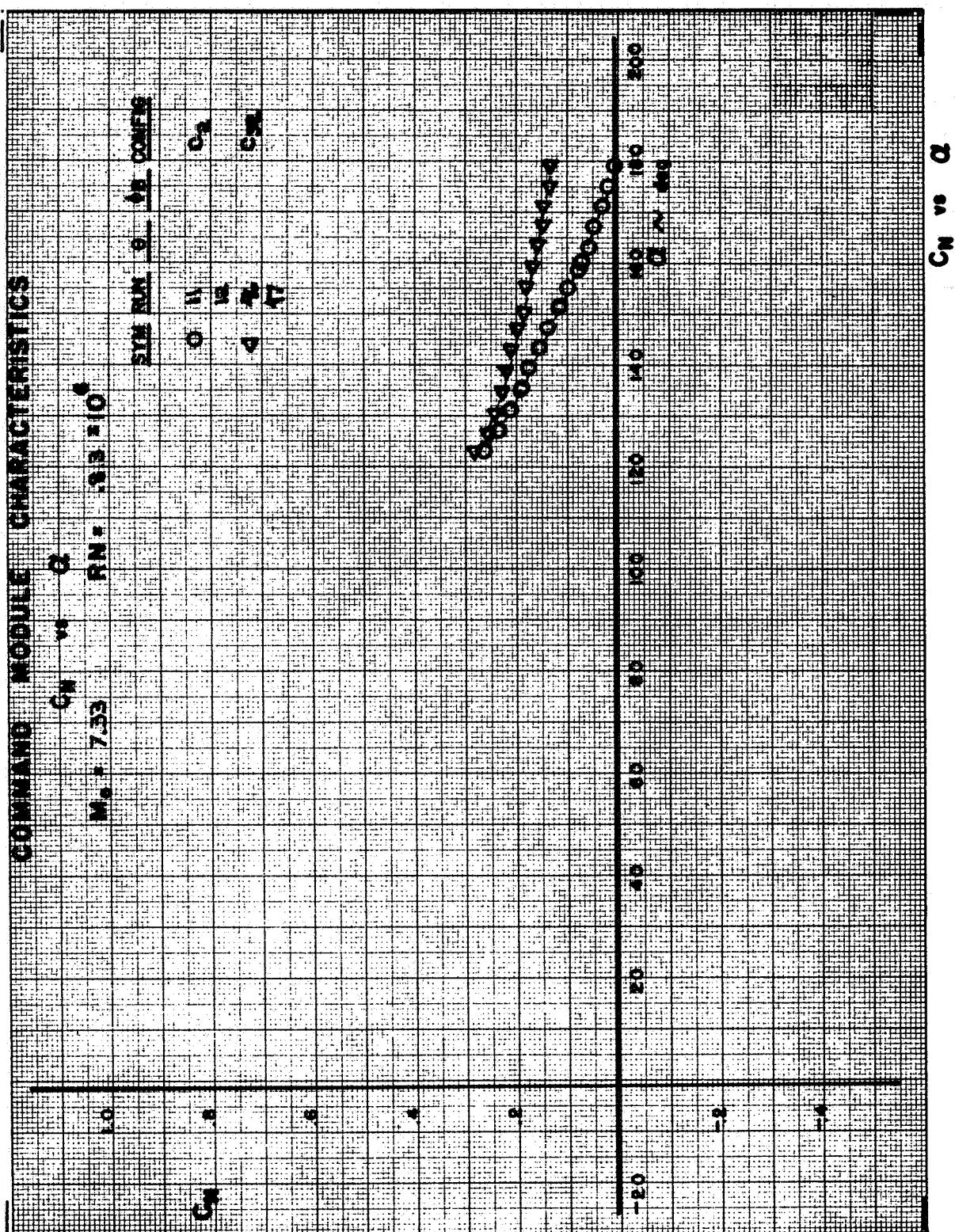
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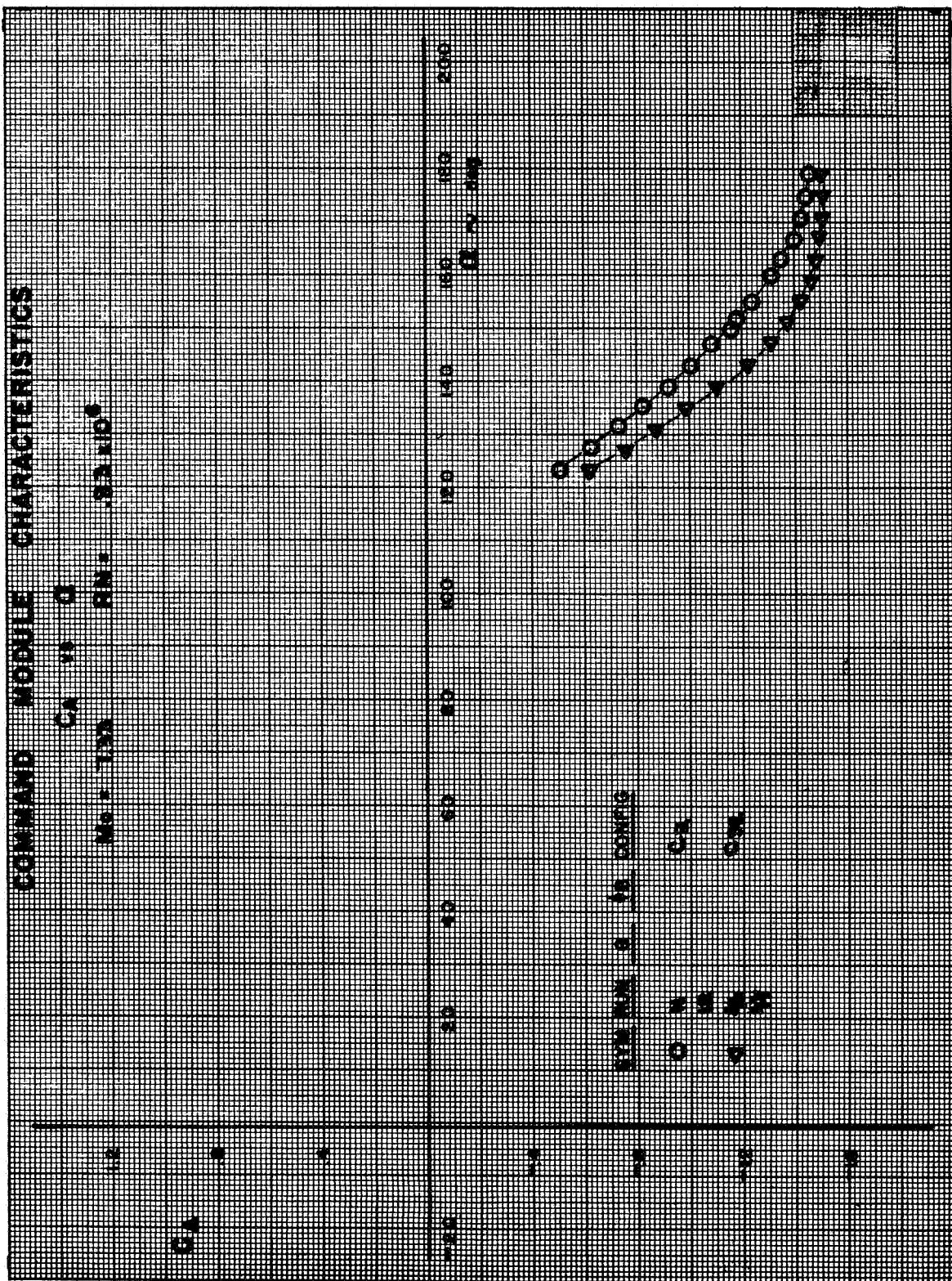
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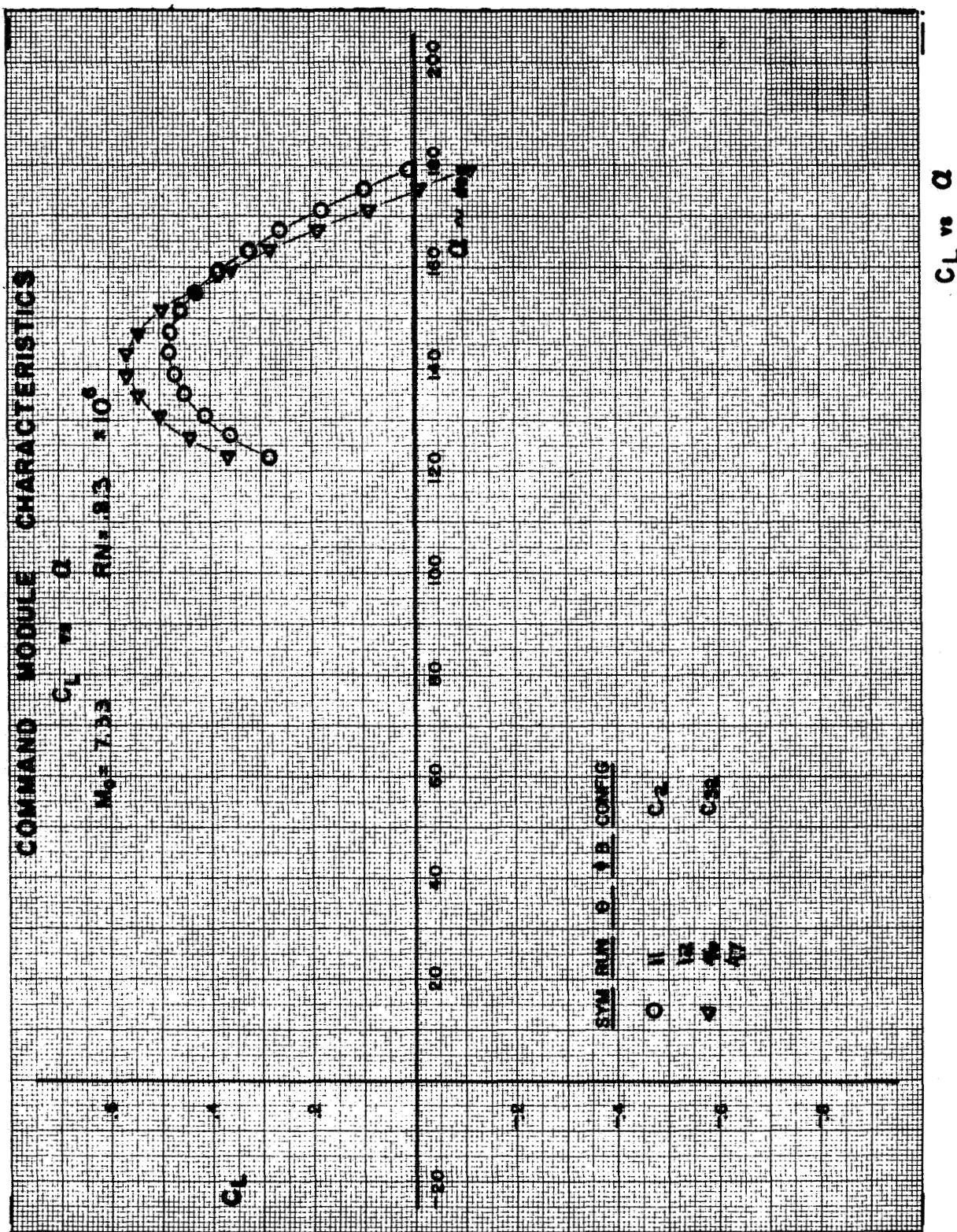




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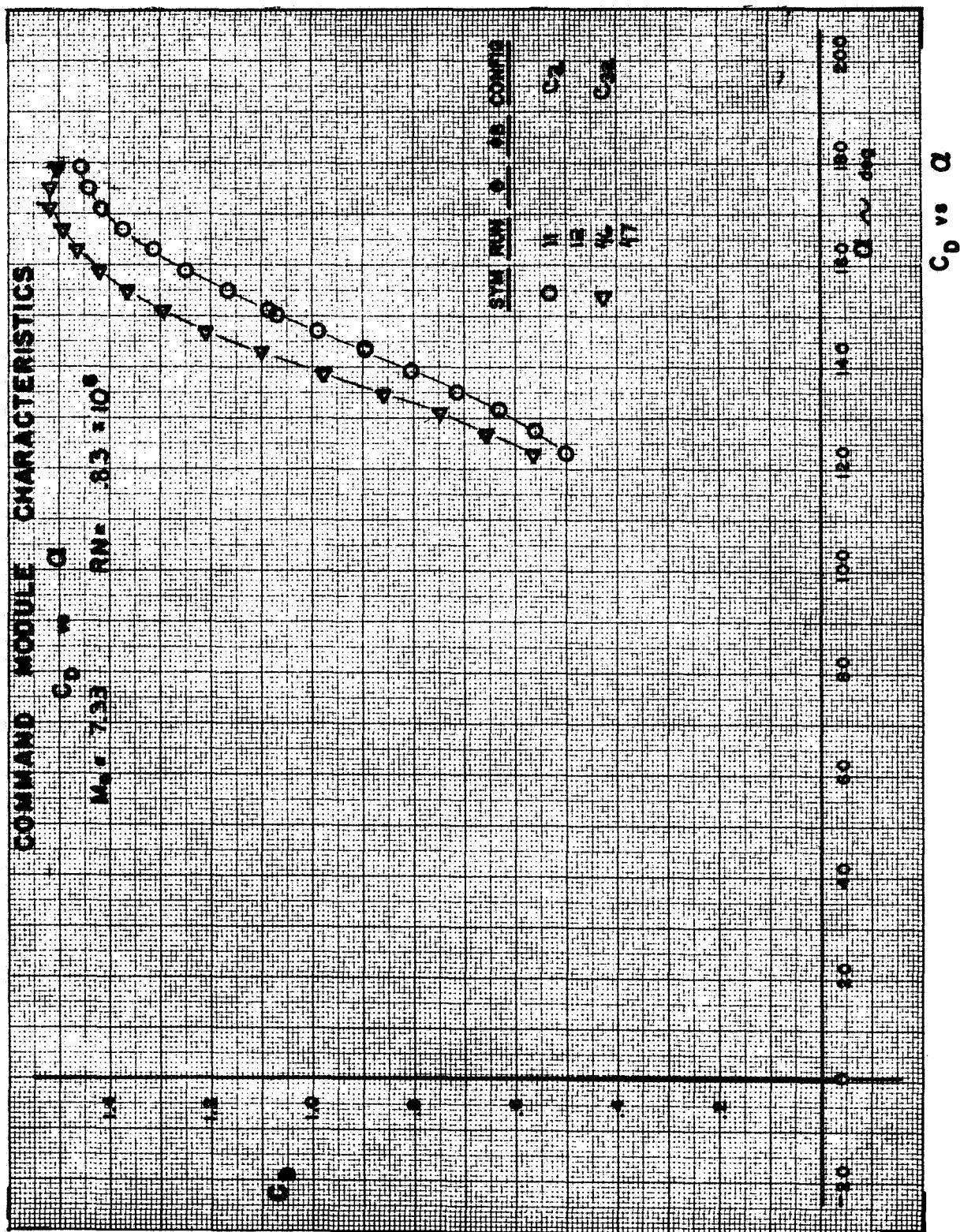


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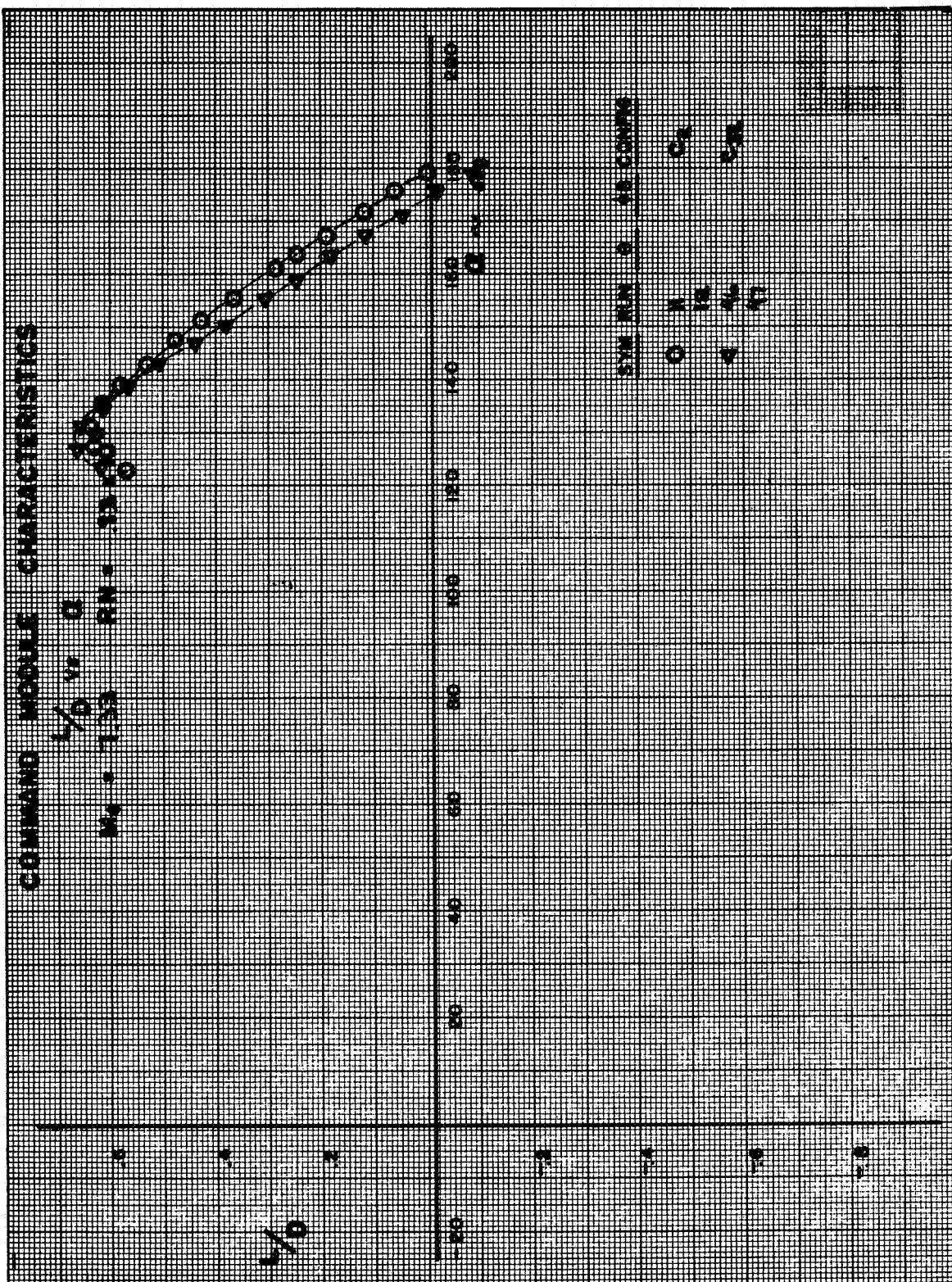


**COMING SOON**



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SID 62-1256



L/D  
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a

NORTH AMERICAN AVIATION, INC.



SPACE and INFORMATION SYSTEMS DIVISION

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